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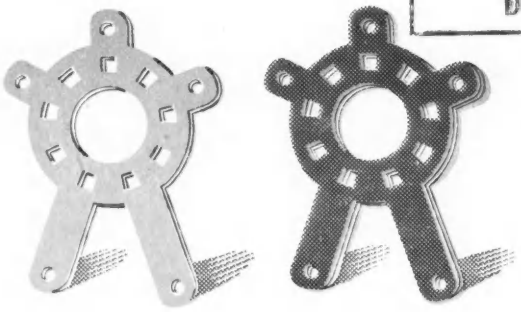
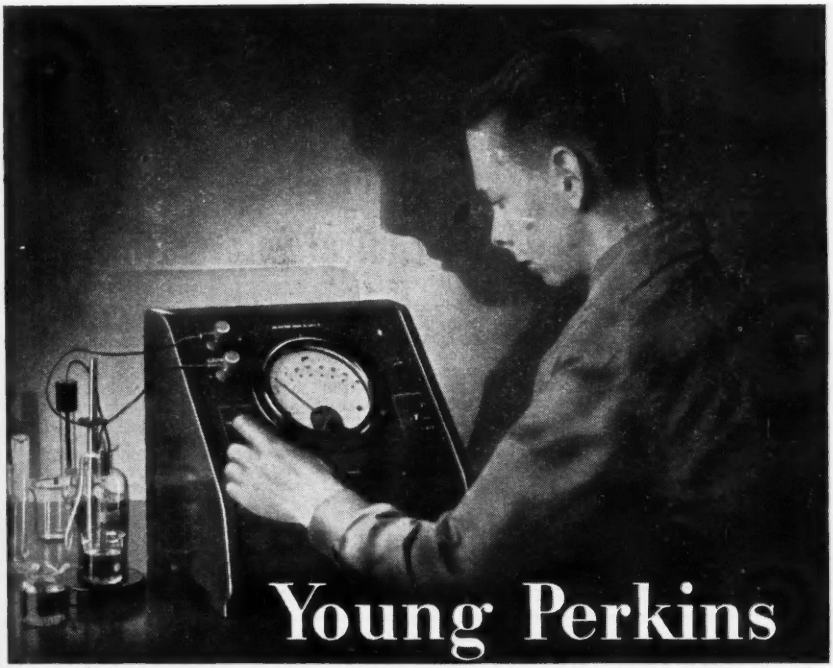
THE CHEMICAL AGE

VOL LVII 6 DECEMBER 1947 No 1482





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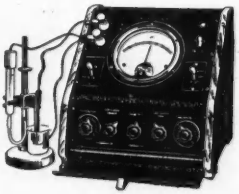

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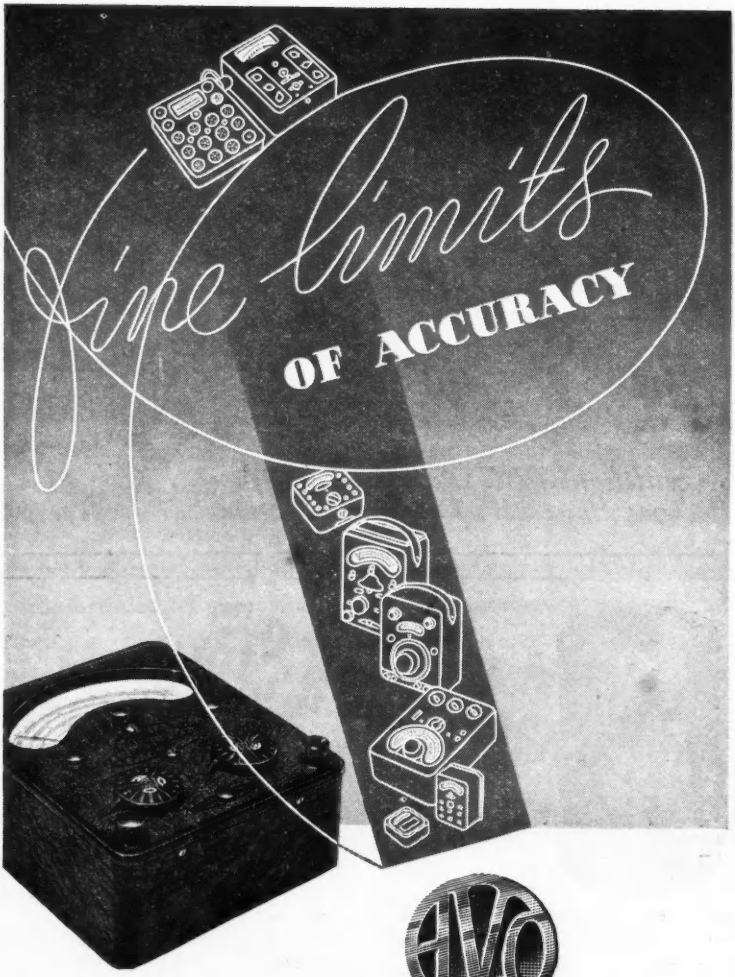

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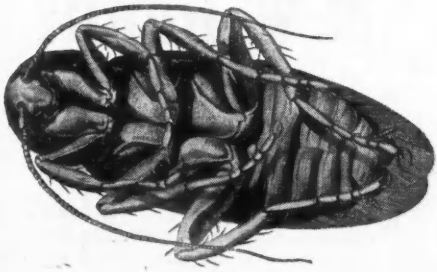

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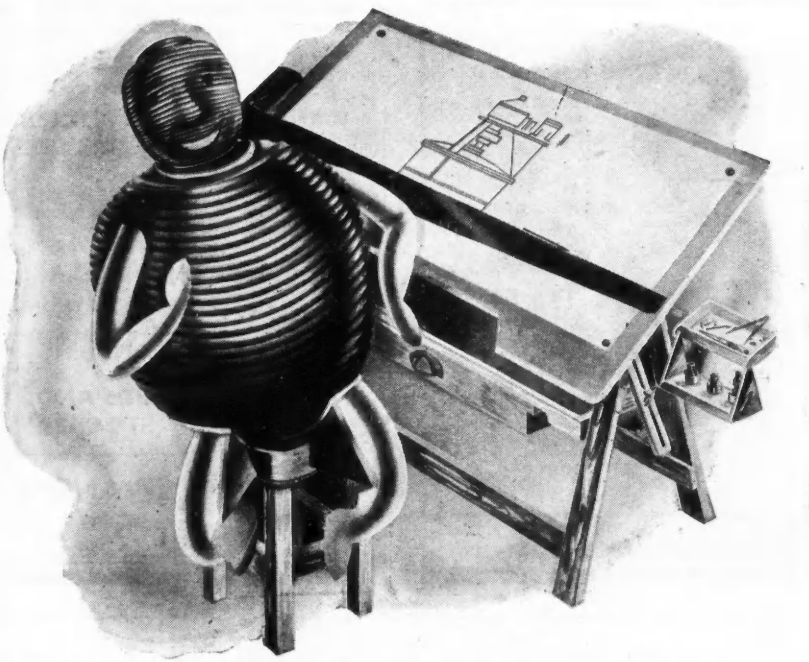

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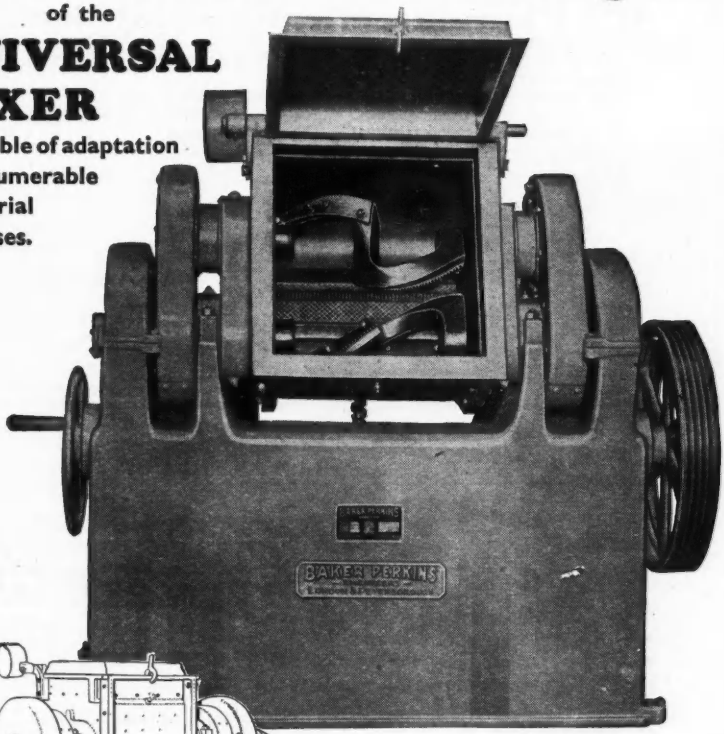

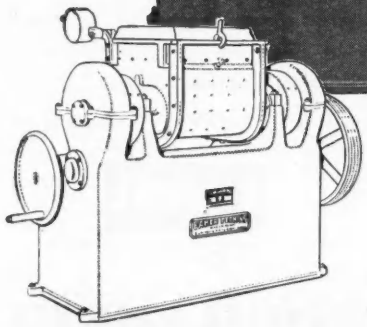

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Vital Capital Equipment

THE chemical industry uses as its raw material air, water, coal, salt, limestone and oil. There are, of course, other substances some of which are found in this country and others which are imported, but it is generally correct to say that the chemical industry is based very largely on indigenous materials and that the supply of raw materials is therefore reasonably satisfactory—or could be made so if everyone did his job.

The industry, however, is not based entirely on raw materials. No industry is. Process plant is the other essential and it is in this direction that the results of the present export drive are likely to be most unsatisfactory. In our anxiety for export we are equipping the world for production often to our own detriment. When the war ended the chemical industry was in a very strong position; the cumulative effect of two wars was to make of the chemical industry—neglected before 1914—one of the major industries of the country. Unfortunately, however, much of the existing plant and equipment through being overworked during the war is now worn out.

Chemical equipment wears out rather quickly because it is peculiarly subject to corrosion and to heavy wear and tear. Moreover, it is inevitable that a fairly high proportion of the chemical plant which was installed in or before 1939 should by now require modernisation as new processes and new methods of construction have been developed.

The modernisation of chemical plant is the source of a great deal of anxiety at the present time. Not only must we modernise existing processes, but we require to put into practice many research results which could not be brought to development during the war. Mr. J. Davidson Pratt in an address to the General Committee of the Parliamentary and Scientific Committee has pointed out that many millions of pounds are now being spent on schemes for the development of the chemical industry, but that these developments are being seriously retarded through difficulties in the supply of coal and steel and through lack of building facilities, plant and so forth. He added "Many in the industry feel that at the present time, when there is imperative need to re-equip our own industries, it is a great pity that plant should be sent overseas to equip other industries that would become our competitors." This view has lately been underlined by Mr. R. M. Shone, Economic Director of the British Iron and Steel Federation.

Now the re-equipment of our industries has received a further setback through the Government's brake on capital expenditure. The Government wants to see a reduction of £180 million in capital expenditure at home; other views are that capital expenditure should be cut by upwards of £500 million. First indications provided in the White Paper which the Chancellor of the Exchequer presented to Parliament on Monday show that the restriction will press heavily upon the chemical and associated industries, largely because of the proposal to transfer to the export market £72 million worth of material, against the current estimated total of £40 million a year, which will completely negative any benefit which might accrue from the planned increase of

On Other Pages

total production from £110 million to £121 million in 1948. This and the severe limitation proposed of building plans cannot fail to have serious results. That policy has been condemned by Mr. Shone and by hundreds like him. He says: "There is a serious danger that the cutting of capital expenditure may be looked upon as the main line of attack on our problems and may lead to an enthusiastic cutting away and sacrificing of projects which are vital to improving the fundamental economic position of the country." He gives, too, the timely reminder that some observers, particularly Americans, have expressed the opinion that the real need in this country is for a still more aggressive policy of modernisation and re-equipment of our industries.

The present modernisation of the iron and steel industry is an example of the advantage of spending money on capital plant, which the chemical industry would do well to emulate. The modernisation of the iron and steel industry shows an average gross return on capital of just over 20 per cent per annum as compared with the costs at the plant replaced. This would of course be reflected in reduced prices.

Taking the figure of benefit from these capital expenditures on the conservative basis of 20 per cent per annum, it may be calculated that 100 units of labour and resources devoted to the scheme would yield a return of 20 units per annum over the life of the plant, say over 20/25 years. The aggregation of the return over a life of 20 years gives 400 units for the 100 units of labour and materials initially expended.

Further developments in this and other industries would, moreover, enable the process to continue so that in fact the return should well be measured on a compound interest basis. The corollary to that, says Mr. Shone, is that, "if all the resources so released could be re-invested to give the same gross return of 20 per cent, the 100 units of outlay would yield an aggregate return of 3700 units over the 20 years' life of the plant. This may be an extreme case and the rate of return from future developments may not be so great. But it does serve to illustrate the vast surplus, far exceeding the original outlay, that is yielded by industrial capital development and which makes it so vital to take full advantage of the most productive openings of this type." We strongly recommend those views to Sir Stafford Cripps.

Quantum Chemistry Course

Commencing on Tuesday, February 6, 1948, a course of six lectures on "Quantum Chemistry" is to be held at the Sir John Cass Technical Institute, Jewry Street, E.C.3. Post-graduate and advanced students are invited to enrol. The lecturer will be Prof. H. S. W. Massey, and the syllabus is as follows: (1) Electronic Structure of Atoms according to Quantum Theory; (2) Quantum Picture of the Simplest Molecules—the new Interpretation of Valency; (3) Quantum Theory and Organic Chemistry; (4) Theory of Metals; (5) Nature of Crystal Binding—Electrode Phenomena; (6) Nuclear Structure.

NOTES AND COMMENTS

Opportunity

FIRST impressions of the amended schedule of United States Import Duties implementing the Geneva Agreement might justify the belief that one of the primary objects of the international accord was to facilitate chemical trading. Of the seven pages of small type in which the *Board of Trade Journal* presents the first instalment of the reduced tariff items three pages relate almost entirely to chemicals, and chemical and allied products figure here and there in the remaining pages. The reductions in import charges are sweeping, in most cases representing a relief of 50 per cent and of 33⅓ per cent in others, sufficient in fact to tip the scales decisively in favour of the British export trader *who can supply the commodities now*. For the moment the italicised words are the operative ones. It can be said at least that a large proportion of the items are those for which British manufacturers sought reliefs in consultation with the Board of Trade when the Geneva Agreement was being negotiated, and thus are included many chemicals, as for instance naphthalene and cresylic acid, which will find a ready market in the U.S.A. for any country which can supply them and, equally essential, can muster the containers in which to ship them. In the present state of the home market there is very little prospect that the agreement can confer any large benefit immediately. Nevertheless, it represents the lever by which the door to golden opportunities may be opened by the countries which succeed first in revitalising their chemical export industries. The moral is obvious. Equally obvious is the obligation which it lays upon Government departments to aid the flow of material and plant for chemical industry by all means in their power.

Welding Progress

AMID the current preoccupation with what renders an industry "essential," with its contingent claims to priority in material and labour supplies, the welders, one would say, are at the moment in a very strong position. In the industrial counterpart of the current domestic mend-and-make-do economy the welding industry is equivalent to the needle and thread; and recently, thanks to the fundamental progress achieved by the scientific study of metals and of welding and inspection plants, the industry has abundantly proved its ability to provide at short notice renovations and adaptations comparable in every respect with new construction. The value of such a service while current material shortages continue is self evident. A summary of some of the advantages which it can now confer appears in the Metallurgical Section of this issue and the prospect of continued widening of technique seems assured by the very progressive spirit which animates the British Welding Research Association—the cost of whose programme in the past 18 months has overrun its very substantial income. An embarrassment at the moment is that the field is too wide: welding is in fact too versatile even for the considerable research organisation that has been built up. The association, as Sir William J. Larke, its president lately announced, is obliged now to reorganise and concentrate its research programme. While the policy at present is almost certain to produce a fuller flow of tangible results in chosen fields, a substantial addition to the association's finances to permit the widest activity would seem to be a good investment for industry as a whole.

Free Scientists

THE growing recognition by the powers that be that the scientist is an indispensable ally in most plans for economic betterment—the subject of our leading article last week—was underlined by Sir Robert Robinson in his presidential address at Monday's anniversary meeting of the Royal Society as being sufficiently important to merit mention as one of the significant trends of the year. Mentioning the comparatively recent creation of the two advisory committees to the Cabinet, the Advisory Council on Scientific Policy and the earlier Defence Research Policy Committee, Sir Robert admitted that while these bodies represented the success in peace-time of an insistent demand in the war years for scientific consultation at the highest level, the consummation had nevertheless evoked some uneasiness. Freedom of research and planning and control might not be in harmony. Those who have shared that suspicion, and they are not few, will have been reassured by Sir

Robert's declaration that, apart from the subtle effects of selective encouragement, "a danger which could hardly be avoided," he was not apprehensive that the dead hand of officialdom was going to stifle scientific progress. Sir Stafford Cripps, he recalled, had already declared his faith in the independent bodies as the competent media for real encouragement of pure research, and there was every reason to think that the Government as a whole realised the vital importance of untrammelled research. Few can have greater interest than Sir Robert Robinson in preserving the liberty and initiative of the research worker. His conclusion therefore should go far to set many minds at rest. "We have not surrendered the power to take the initiative, and we retain the traditional privilege of access to authority. Our public usefulness depends therefore on our own ability to suggest and promote action and we have even gained potential for independent leadership."

"Merit" Payments

THE principle of evaluation of wage rates on a points basis in an integrated wages structure was widely canvassed here some months ago and the subject fairly certainly has not been entirely discarded, although economic urgencies of another kind have swept it out of view. Meanwhile, it is worth noting that in one other country an approach of a somewhat similar kind to the same problem is being made. In Czechoslovakia social and economic factors admittedly differ too widely from their counterparts here for a direct parallel to be drawn, but the uniform system of wages on a "merits" basis now being instituted there is not without interest. The system has already been adapted to the metallurgical industries. Some details were given recently by K. Stastny in the Czechoslovakian metallurgical journal, *Hutnicke listy*. The basis of the system is the standard of education and training of the worker, the kind and amount of work done, and the effort made. For some sections of the metallurgical industries there are eight classes; but with foundrymen and smiths there are nine classes owing to the specially hard work involved. The classification generally is reviewed, with examples, and a table of wages made up on the new system for both piece workers and time workers is now in operation.

U.S. HAS NEW ANTI-MALARIAL DRUG

IN an address to the Western New York Section of the American Chemical Society at Buffalo, New York, recently, Dr. R. C. Elderfield, Professor of Chemistry at Columbia University, announced that a new anti-malarial drug which, when used with quinine, is capable of effecting cures in 95 per cent of all malaria relapse cases, had passed all clinical tests and was practically ready for commercial production. Subsequently, the significance of the professor's statement has been diminished by an announcement in a business magazine that America's supply of cinchona bark is heading towards a state of critical shortage since the bark is the source of quinine and quinidine, without which millions of people suffering from malaria and heart ailments cannot carry on normal lives.

The new drug is 6-methoxy-8(4-isopropylamino-1 methylbutylamino)-quinoline, and is identified by the number SN 13,274. It was first synthesised in Columbia University's Chemistry Department in October, 1945, when the department was working under an anti-malarial contract with the U.S. Office of Scientific Research and Development. (THE CHEMICAL AGE, October 18, page 549.) The greatest problem was to discover a drug that would reduce toxicity as much as possible. Until the present discovery, pentoquin was considered the best of the anti-malarial drugs and was a great improvement over the German drug plasmochin, which was regarded as too toxic to be of much use. Columbia University has continued its work in developing more practical ways of producing the new drug and is exploring related compounds.

The cinchona shortage is attributed to the three following factors:—

(1) The Dutch, who have controlled the world cinchona supply for 100 years, announce they have regained 90 per cent of the Javanese cinchona plantations over-run by the Japanese during the war (Indonesians hold the rest). To American buyers, this means that the Dutch cartel has returned.

(2) The U.S. Government is preparing to end most of its controls over quinine, quinidine and bark on February 29, turning the U.S. trade back to private enterprise. The Government will, however, hold an emergency reserve of 1.2 million ozs.

(3) The U.S. Government is reported to be ceasing to purchase cinchona from Central America, whence supplies have been obtained ever since the Japanese captured Java.

River Pollution Charge

Potassium Cyanide

THE emptying of a tank containing 180 gal. of potassium cyanide into the River Seiont recently, had its sequel at Caernarvon on November 29, when Mr. T. Catterall, factory manager to Hunting Aviation, Ltd., was summoned for poisoning the river waters. It was stated that Mr. Catterall's act had destroyed 600 fish, and from the point of introduction (the company's Peblig Mills) to the sea, marine life was extinct. The defence was that the tank was thought to have contained water. A verdict of "guilty" was returned, and fines to be imposed will be announced at a subsequent session of the court.

Waste Treatment: U.S. Forcast

The growth of American industry has rapidly increased the problems of waste disposal and stream pollution. Surveying existing waste disposal laws in the United States at the American Institute of Chemical Engineers' fortieth annualy meeting in Detroit, Mr. Anthony Anable and Mr. R. P. Kite, of the Dorr Company, stated that almost all States have tended toward increasing restrictions, and conclude that existing violations will be prevented. They state that " the future waste treatment plant will be designed and built simultaneously with the major plant, and regarded as important an operating element as any other plant process."

Waning Power of Penicillin

The power of penicillin over grave staphylococcal infections is already well on the wane and we must look to a future in which the problem of treating these infections has almost to be faced afresh. This consummation of what was earlier predicted by medical scientists is noted by the *British Medical Journal*, which adds that penicillin-resistant staphylococci are encountered with increasing frequency, and the present enormous consumption of penicillin can be accounted for only by much indiscriminate use.

Amendment of Insurance Act Sought.—The General Federation of Trade Unions, representing some 300,000 skilled craft workers in a variety of industries, is appealing to the Ministry of Labour to make changes in the National Insurance Act relating to unemployment benefits. The Federation is asking for restoration of the provision under which unemployment benefit was payable to workers involved in a stoppage "due to an employer acting in a manner so as to contravene the terms or provisions of an agreement to which the employers and employees are contracting parties."

Capital Expenditure Cuts

Less Building and Machinery Next Year

"TO bring the volume of new investment undertaken into proper relation with the reduced supplies of materials, industrial capacity, and man-power that we can afford to make available for this purpose," the Government has announced this week in a White Paper, " Capital Investment in 1948," its intention to bring about a reduction of capital expenditure of £180 million below the estimated total of £1600 million. All phases of national development, including State enterprises, have been marked down for more or less drastic reductions and first indications are that future industrial building, excepting those schemes which have already been assured of material permits and also certain specified industries, will be discouraged.

In the matter of modernisation and replacement of industrial plant, the proposals of the White Paper foreshadow intensified difficulties. Its proposals for plant and machinery are that total production, now running at £110 million a year, shall be increased to a rate of £121 million by the end of 1948. Current exports of £45 million will be raised to £72 million. This and other changes will transfer production represented by 60,000 tons of steel a year from the home market to export.

Plant investment is divided into three categories, by State industries, public authorities and private industries. It is admitted that, short of reintroducing a system of individual licences to acquire plant and machinery, there is no possible method of detailed control of private investment.

While the export quotas set for machinery will automatically limit such expenditure, this by itself may not be fully effective in restraining the volume of investment attempted. There is a danger that exports or important home needs may be prejudiced by the pressure of demand for certain products for less essential purposes.

" The Government," says the White Paper, " are reluctant to reintroduce licences to acquire on a large scale and will, therefore, rely for the present on the good sense of private industry following a policy lead." The matter will be the subject of conferences with the appropriate industrial organisations.

Argentine Linseed

It is reported from Argentina that only 4,009,000 acres are under cultivation for linseed this year. From this acreage a crop of no more than a million tons is expected. Last year, 4,698,000 acres were planted. There has been a noticeable decline in the republic's linseed production each year since 1939 when 7½ million acres were under cultivation.

Growth of Gas Research

Synthesis & Hydrogen Sulphide Recovery

THE widening of the scale of research originated by The Institution of Gas Engineers was manifest at the institution's autumn research meetings in London last week, in the course of which Dr. H. Hollings, chairman of the council of the Gas Research Board, reviewed current investigations.

Because of the increased size and importance of this work, which is rapidly absorbing all surplus income, several small panels of experts have been set up to advise on specialised aspects of scientific research being undertaken.

Pressure Gasification

Dr. Hollings reported:—

"The work on the gasification of coal under pressure is proceeding at Bournemouth. It will be remembered that the original pressure vessel was designed for a study of the hydrogenation of coal. On the advice of the panel which has this work under review, the council is now considering the practicability of obtaining a new pressure vessel designed primarily for a study of the behaviour of various bituminous coals when gasified under different pressures of steam and air.

"An order has been placed for a small water gas generator specially designed for operation with a preheated air blast. The trials to be made as soon as this plant is available should indicate the practicability or otherwise of obtaining higher thermal efficiencies which several calculations in recent years have shown to be possible in water gas manufacture.

"It is probable that within a few months the programme of work on methane synthesis will have reached a stage at which we can present a final report. The large scale trials of catalysts at Bournemouth are proceeding very satisfactorily and if we can suspend this work pending some industrial development of the process we can release staff for other work.

"The new programme concerned with the removal of hydrogen sulphide from gas has made a very promising start. With the generous help of the Bournemouth Gas Company we are securing additional laboratory space at Bournemouth and the programme of work remitted to the staff stationed there is being extended."

Oil from South African Coal.—A plant for the extraction of oil from coal is being erected in South Africa, and will incorporate the most up-to-date U.S. features. Within about three years it is planned to produce 60 million gallons of petrol and 9 million gallons of diesel oil, according to Mr. Hersov, chairman of Anglo-Transvaal Consolidated Investment Company.

Government Purchasing

Medical and Scientific Supplies

FROM December 1 the Ministry of Health has taken over from the Ministry of Supply general responsibility for purchasing medical supplies to meet Government requirements. The change-over is effected under the Transfer of Functions (Medical Supplies) Order, 1947, published last week. It involves the transfer to the Ministry of Health of the functions, responsibilities and staff of the Directorate of Medical Supplies, including those of the Penicillin Production Control and the related Contracts Branch of the Ministry of Supply.

All correspondence which was formerly addressed to the Directorate of Medical Supplies should be addressed to the Secretary, Ministry of Health, Whitehall, S.W.1. The telephone number (Abbey 7788) remains unchanged, and the new telegraphic address will be "Localise, Parl, London."

The functions transferred include the purchase and inspection of Government requirements of drugs, dressings, and medical and surgical equipment, and responsibility for sponsorship of firms producing these supplies for civil needs.

The purchase of Government requirements of scientific glassware (furnace blown, pressed and lamp blown), laboratory apparatus and equipment, laboratory porcelain and liquid-in-glass thermometers (other than clinical thermometers) now becomes the responsibility of the Ministry of Health. The executive functions of sponsorship of the industries and firms manufacturing these products (*e.g.*, allocation of materials, consideration of building licence applications, labour questions, etc.), will in future be exercised by the Director of Instrument Production, Ministry of Supply, 18-24 Hyde Park Street, W.2 (Telephone—Ambassador 1290).

NIGERIA TO HAVE UNIVERSITY

A UNIVERSITY College is to be established at Ibadan, Nigeria. A five-acre site has been acquired and surveyed, and an architect is to be appointed immediately to plan the permanent buildings. The only appointment so far confirmed is that of the principal—Dr. K. Mellanby—who is already in Nigeria. Professorial staff for the various departments including that of chemistry are shortly to be appointed. There is already in existence a higher college at Yaba, and the staff and student body of this college is to form the nucleus of the University. THE CHEMICAL AGE is informed that by the end of 1949, the project will have taken practical shape, and that research and development work in connection with organic chemistry will be well under way.

Reforming the Law of Negligence

Proposed Removal of Anomalies

LAST week saw the publication of the Law Reform (Personal Injuries) Bill. It is largely based on the report of the Monckton Committee, which was set up to consider among other things the changes in the law affecting personal injuries which would be necessary if the proposals of the Beveridge report were carried into law.

The Law Officers are to be congratulated on their promptitude in proposing legislation. The law of negligence must adapt itself to modern conditions, especially changing methods of work. In the past there has been great reluctance to amend the law, even where it was obviously unfair or out of date. This new measure, together with the Contributory Negligence Act 1945 and the Crown Proceedings Act, 1947, does much to improve this branch of law.

Reform Overdue

The iniquitous doctrine of common employment will now in all probability be interred—rather belatedly. The remarkable thing is that it has survived for so long. It has been universally condemned for many years and the Courts have done their best to whittle it down. It lays down that a workman may not claim against his employer for injury caused to him by the negligence of a fellow employee; the reason given for this was that a workman was presumed to agree to undergo the risk of injury by a fellow employee, a legal fiction in no way related to reality.

Much hardship also has been caused by the doctrine of election, which applied where a workman had two possible remedies against his employer, either under the common law or under the Workmen's Compensation Acts. A workman who, in the full knowledge of his rights, accepts workmen's compensation, disbars himself from suing at common law. It has often been pointed out that this is a great hardship on the workman who, in urgent need of money, may not be able to await the result of an action at common law. Certain unscrupulous insurers had developed a practice of offering a prompt payment of workmen's compensation, in order to defeat the common law rights. But this was effectively stopped by a decision of the House of Lords some 18 months ago, that an action at common law is barred only by the acceptance of compensation, where the workman accepts compensation in the full knowledge of his legal rights.

The passage of the National Insurance (Industrial Injuries) Act, 1946, compelled a reconsideration of this doctrine. The substitution of state insurance for workmen's compensation struck at the whole basis of election, as the worker no longer had alternative remedies against his employer. The question now arose as to whether he should get both insurance benefit and damages, or whether the benefit should be deducted from damages. A majority of the Monckton Committee favoured the latter course. The new Bill is a typically English compromise. It provides that one-half of the insurance benefit which is likely to become due within five years of the accident, shall be deducted from damages. Widows and the permanently disabled, who are likely to receive benefit for a great deal longer than five years, will benefit considerably from this compromise. In assessing the benefit no account is to be taken of the increased pension payable to a person who required constant attendance. Medical expenses are to be allowed, where a person has employed a doctor instead of making use of the free services provided by the National Health Acts.

Unreasonable Ruling

One section of the Bill gives relief to the employer. At present he is liable to an employee who is injured by reason of the employer's breach of some statutory duty, usually imposed by the Factories Act or the regulations issued under it. The Factories Act imposes an absolute obligation and an employer will not be excused for a breach however good his excuses may be. It will now be a defence for the employer to show that it was not reasonably practicable to avoid or prevent the breach which caused injury or death.

The new Bill will apply over the widest field. It binds the Crown, thus covering Government employees and covers all forms of injury, including purely mental injury and impairment of health.

U.S. SYNTHETIC FUELS

AMERICAN petroleum requirements before the war were around 4 million barrels a day; in war they were 5 million barrels and are now 5.5 million barrels. This, in conjunction with dwindling resources—says Mr. W. C. Schroeder, chief of the U.S. Office of Synthetic Liquid Fuels—makes it additionally necessary to expedite the economical production of petroleum from natural gas, coal and some other sources. Coal, of which the U.S. contained probably 50 per cent of the world supply, was the most obvious source of all kinds of fuels, from the highest octane spirit to heavy oils. Two million barrels of synthetic fuel daily requires an investment of $8-9 million and probably 15 million tons of steel.

Plastic Protective Coatings

Some Useful Applications of the Flame-Spraying Method

ATTENTION was drawn in a recent article to the frequency with which it is necessary to resort to traditionally protective materials such as earthenware, wood and lead, in providing exhausting equipment for corrosive and noxious fumes. A comparatively recent development, namely, the flame-spraying of plastics, offers a range of interesting and valuable possibilities which deserve study. Hitherto the application of plastics to plant and vessels has been by painted or air-sprayed solutions, or affixing of the plastic in sheet form.

The use of solutions of plastic in solvent is not always satisfactory because of the comparatively low solubility of the higher polymers in the commercially applicable solvents, resulting in thin coating and in the necessity of drying and eliminating the solvent. The use of plastics in sheet form is a relatively long and expensive process.

Simple Process

The flame spraying of plastics on the other hand is a recent development whereby the material is passed through an oxy-acetylene or oxy-propane flame, softened and melted and so coated in a fused and homogeneous layer on any desired surface. The surface can be metal, wood, stone or stoneware, brick, asbestos board, in fact almost any constructional material.

In flame spraying, the most suitable plastic for the particular process or requirement is chosen and the thickness of coating is wholly under the control of the sprayer. The spraying is carried out with a flame spraying pistol, by a process evolved in this country during the last few years by the Schori Metallising Process, Ltd., London, N.W.10, the pistol being the Schlori powder pistol.

An important characteristic of all the plastics sprayed by this method is that they are all waterproof and for the most part very inert to all the usual chemical vapours; the newer plastics such as polythene, the polyvinyls, acrylic and styrene plastics are in fact some of the most inert materials known in the chemical world. Moreover, many of them also have outstanding di-electric properties and so can play a dual part as protectors against violent corrosive attack and are first-class electric insulators.

The fact that these coatings are flame sprayed at once eliminates one of the troubles of painting, namely, the necessity for drying, and in some cases, eliminates solvent vapours. Spraying, which can be carried out either before plant is assembled, or *in situ*, calls for preparation of the same order as painting, but the heat of the fused sprayed coat, and the fact that no solvent or vehicle is present, means that with all but one plastic, the sprayed coat is dry and ready for use as soon as the coat is cool, that is in a minute or two. This is a very valuable advantage.

The exception is Thiokol, a valuable synthetic rubber, in powder form, which is not only highly resistant to almost all chemical fumes, but provides an elastic, resilient coat which withstands a tremendous amount of impact from solid particles carried along in a powerful air-stream.

A thick coating of about ⅛ in. of Thiokol on steel plates has been used successfully to protect the walls of shot-blasting cabinets against the continuous stream of chilled iron grit used to clean and prepare metal surfaces for spraying. It is the only sprayed plastic which remains tacky for some hours after spraying.

The spray pistol is simple to handle, having no moving parts beyond three simple valves controlling the air and gas. The powder is impelled by compressed air, generally at pressures between 10 and 20 lb. sq. in. and the combustible gas can be acetylene or a soft gas such as propane, the latter preferably, as plastics do not require too intense a flame.

Air Pressure Control Important

Oxygen is used at a pressure of 25 lb./sq. in. and the propane at 9 lb. Control of the air pressure is an important part of the "know how" as it regulates the correct fusing of the plastic upon which the successful spraying of plastics depends. Hence while the pressures of oxygen and propane, or other gas, are regulated once and for all at the commencement of spraying, the air is regulated to ensure that there shall be no over-heating, and that the fusing of the plastic coat shall be completed.

The surface to be sprayed must be clean and entirely free from dust, rust, scale, etc. In the case of metal it is the rule to shot blast before spraying as this ensures a perfectly clean metal surface and a mechanical key for the plastic also. In the case of the light metals, aluminium and light metal alloys, the shot blasting can be dispensed with and that applies to many non-metallic substances such as wood, asbestos board, slate, stone.

The rate of spraying depends upon the thickness of coating to be applied. In the case of most plastics, thickness of coat ranges from a few thousandths of an inch to ¼ in., the thickness depending upon the duty the coating will be called upon to give.

Sprayed plastics may be used to protect the interior walls of chambers or ducts, to cover the blades and hubs of impellors or fans, also metal gates or dampers; they must not be used where temperatures above 60° C. are involved as above that temperature their

resistance to various agents is lowered and they may begin to soften. That at present is a drawback to their wide application, but it should not be long before other plastics are available having softening points very much higher than 80-100°C. In fact, the chemist already promises plastics having softening points up to 150°C. and there have been indications that we may expect materials having resistance to chemicals at present unequalled and a softening point as high as 350°C. For the moment these statements emanate from the U.S.A. but we do not usually lag far behind in development.

A specific application of polythene has been in the coating of mechanical stirrers for mixtures and solutions of a highly corrosive character. Another analogous application is the treating of stirrers used in electrolytic cells; here the polythene acts as an electric insulator as well as protection. Mention may be made of a developing use of polythene coating in the electro-plating industry where the coating of jigs and hangers has put an end to the loss of metal through the plating of these components, and resulted in notable economies in the plating shops.

In both the chemical and electrical industries a simple method of testing for pinholes in coating of polythene on metals is essential. The method used by the Schori Laboratories is simple and efficient. Two 240-volt high tension batteries are connected in series through a resistance of a quarter of a million ohms to a milliammeter and thence to a brush—an ordinary fairly soft bristle brush—the other terminal being to a metal clip which is attached to an uncoated spot on the coated metal to be tested. The electrolyte used is tap water and the brush is wetted and passed over the coated surface. A pinhole or the like will be marked and the faults rectified by a refusion at the point where the defect occurs.

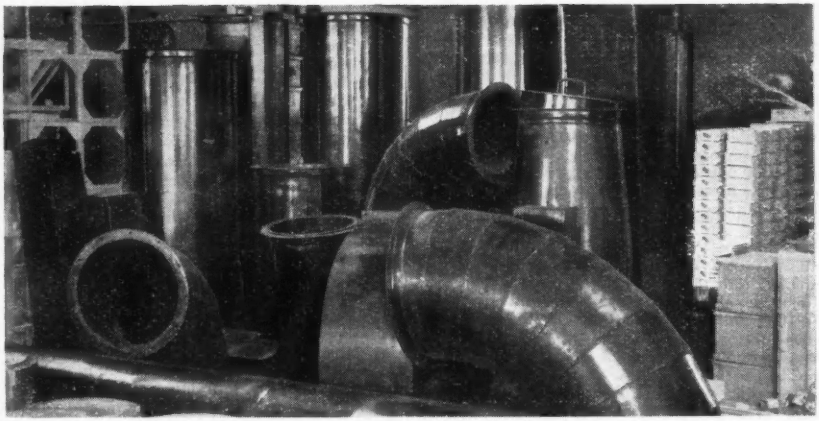
Ebonite and Elementary Sulphur

For the moment the choice of a protective against acid fumes, even including hydrofluoric and the strong mineral acids, so long as they are below 60°C. lies with polythene, with Thiokol second. Not only have these plastics been used for ducts, fans and chambers, but also for coating the interior of reaction vessels. Polythene has proved very successful in this direction.

An ancillary application of the flame spraying technique of interest to many chemical engineers is the possibility of spraying ebonite. This is as yet hardly past the experimental stage, but some promising results have been attained.

German Metallurgy

Information on the composition and thermal and magnetic properties of "Thermoperm," a complex type of nickel steel used in Germany as a temperature compensating device in the construction of magnetic tachometers; tantalum production by Siemens and Halske in Germany and technical data on various types of heat resisting alloys considered or used in fabricating turbine blades for gas turbines and jet engines in Germany are contained in the latest reports by the U.S. Office of Technical Services, Department of Commerce, Washington.



Evidence of the versatility of such impervious plastic coatings: a representative selection of industrial ventilating and other equipment recently given enduring protection by this method

Italian Chemical Notes

From our Rome Correspondent

THE Egyptian Government is reported to be negotiating for the purchase of the Italian-owned Egyptian Company for Production and Trade in Phosphates, which was founded in 1912. Most of the shares were originally held by the Bank of Rome, which later transferred them to the Italian Government. The minority shares have remained in Egyptian hands. The company owns two calcium phosphate mines—at Djebel Duwy and Djebel Hamandat. They are connected by a short railway line with the port of El Kosseir on the Red Sea. Although Moroccan phosphates are purer (80-85 per cent) than the Egyptian (72 per cent), it is often more profitable to accept slightly inferior phosphates than to pay the Suez Canal passage duty to which the Moroccan variety is subject. As Italy owes £4,500,000 reparations to Egypt, it is probable that the Egyptian Government will succeed in inducing Italians to sell.

* * *

Although output of the principal acids such as nitric, sulphuric and hydrochloric, is satisfactory, it is difficult to predict a continuance of this state of affairs throughout the winter. Oxygen required by the metallurgical industry may be in short supply due to restricted use of electricity, though some factories now operate their own generating units. Some concerns have found themselves in financial difficulties owing to the recent restrictions in banking credits. Others find it difficult to pay the now surplus personnel which they are not allowed too dismiss. In this sense the factories making explosives are the worst off. Their output is nowhere near the war-time level, yet they are obliged by law to retain the large numbers of employees acquired during the years 1938-42.

* * *

The situation of Italian soap industry has improved considerably because many of its raw materials have been reduced in price, and the market readily absorbs the entire output. Nevertheless, it remains true that this industry is working only at about one-third of its total capacity owing to the shortage of vegetable and animal fats. In 1939 Italian soap industry consumed about 160,000 tons of fats, 83,000 tons of which had to be imported. This year the industry had to be content with 36,000 tons produced locally.

* * *

The Italian Ministry of Foreign Trade in agreement with the Ministry of Industry and Trade, has decided to ban imports of fluoridic acid because it is felt that home production is sufficient for the needs of the country.

Helium from Natural Gas

Low Temperature Process

EXPERIENCE gained in the low temperature production of helium from natural gas is helping U.S. chemical engineers to design new plants important to the country's economy. This is the opinion of Dr. P. V. Mullins, of the U.S. Bureau of Mines, expressed in a paper read recently before a meeting of the American Institute of Chemical Engineers. The plants are in the low-temperature industries of which the production of low-cost oxygen is an outstanding example.

Although the design of existing plants for the production of helium is not entirely new, the process is important as the forerunner of many new low-temperature processes, such as refrigeration in the manufacture of pure chemicals from petroleum. The major use for helium to-day is in lighter-than-air craft, and all production facilities are owned and operated by the Bureau of Mines. These facilities are located in the south-west where helium—a constituent of natural gas in amounts varying from 2 to 8 per cent—is isolated by a process of liquefying the other gases present by refrigeration. Liquid nitrogen, which liquefies at 310°F. below zero, is the primary refrigerant.

CZECH CHEMICAL AGENTS

CZECHOSLOVAK Chemical Works (London), Ltd., is the name of a new company formed in London to act as agents for the Directorate General of the Czechoslovak nationalised chemical industries in Prague. Its aim is to foster mutual trade in chemicals, chemical raw materials and chemical plant between Great Britain and Czechoslovakia. The board of directors is as follows:—

Dr. K. Martinek (Director-General of the Czechoslovak Chemical Works, National Corporation, Prague), chairman; Dr. George Lewi (London), acting chairman; Mr. C. F. Ward Jones (London); Mr. David Finnie (London); M. E. Patin (Paris); Dr. M. Marko (Prague); and Mr. B. Dostal (London), manager. The address of the company is 35 Pont Street, London, S.W.1.

Canadian Embargo.—Included in an extensive list of goods the importation of which into Canada is prohibited as from November 17 are the following: Paints and colours, ground in spirits, and all spirit varnishes and lacquers; varnishes, lacquers, japans, driers, liquid driers, and oil finish, n.o.p.

SULPHITE AND SULPHATE PULP

Improving Technique in Canada and Scandinavia*

THE discovery of a mechanical means of fibre liberation from wood inspired intensive research. The most important development was the discovery of the sulphite method, in which wood is "cooked" in an acid solution of calcium bisulphite.

The manufacture of cellulose by this means rapidly spread throughout the world. To-day the Canadian production of bleached and unbleached sulphites amounts to almost 2 million tons, and the world production to over 10 million tons.

Basic Principles

The sulphite method of fibre liberation consists in reacting wood chips with a solution of calcium bisulphite and sulphurous acid at elevated temperatures and pressures. The bisulphite presumably reacts with the lignin, and there also takes place a hydrolytic splitting of the cellulose-lignin complex.

It has been shown that these reactions are governed both by the hydrogenation and bisulphite-ion concentration, and evidence seems to indicate that the sulphonation reaction is the more important.[1] The calcium salt of sulphonated lignin is rendered soluble, the easily hydrolysable hemicelluloses are dissolved at the same time, and the comparatively stable cellulose remains, its properties and yield depending to some extent on the cooking conditions.

Cooking of the wood chips is carried on with an acid of about 5 per cent total and 1.15 per cent combined SO_2 using direct steaming, for a period of 8½ to 12 hours depending on properties required in the finished pulp. Maximum temperatures vary from 125-145°C. and cooking pressure from 65-75 lb. per sq. in. The pulp so obtained represents approximately 50 per cent of the wood.

All sulphite mills in Canada use lime as a base for cooking acid, both because of its availability and its low cost. The chemical so used is run into the rivers with the lignin and other wood constituents and some sulphur. Attempts have been made from time to time to concentrate this waste liquor and burn it under boilers as a source of steam for the process but due to the nature of the base and the extensive difficulties caused by the deposit of calcium sulphate on the evaporating surfaces, this process is not established.

Recently, there has been developed a process in which magnesia instead of lime is used as the base in the cooking process. In this process the cooking is carried out in the usual manner, and on completion of the cooking the liquor is removed from the pulp by rotary drum washers with as little dilution as possible, concentrated, and burned in a special furnace for the production of steam.[2] The base is recovered as magnesium oxide and may be re-used in the process.

The economics of the process depend to a large extent on the steam obtained from the burning of the liquor. It is the excess steam over and above that required for evaporation which determines the real savings. Total savings of up to $5.00 per ton of pulp over the conventional lime-base process have been claimed.

The use of a soda base to replace the lime base is in commercial operation at Stora Kopparberg's mill in Sweden. Using an acid of 5 per cent, and 1 per cent sodium oxide, chips are cooked in the usual way at a maximum pressure of 100 lb. per sq. in. Digester contents are blown into diffusers and the liquor removed from the pulp. This liquor is then evaporated, thickened, and burned in a Tomlinson furnace. Steam recovery was reported to be 2.8 tons per ton of pulp after the evaporation steam is subtracted.[3]

Troublesome Sulphur

Details as to the liquor recovery and make-up are not known; generally speaking the burning of this liquor has resulted in the formation of many troublesome sulphur compounds which have impeded the general adoption of the process. In the Swedish mill, the soda process is operated in conjunction with the sulphate process and the recovery methods appear to be interdependent.

An interesting method of sulphite operation is that of using an ammonia base system which is operating on a mill scale in Norway. Here, liquid ammonia is dissolved in water and SO_2 absorbed in this 5 per cent solution. The cooking acid contains about 6-7 per cent total and 1 per cent combined SO_2. Cooking is carried out conventionally to completion, and the liquor collected and evaporated in multiple-effect evaporators to a 55 per cent solids content. No "liming-up" troubles occur and the

*"Pulp and Paper—A Canadian Chemical Process Industry," by Allan C. Hill. *Canadian Chemistry & Process Industries*, October, 1947.

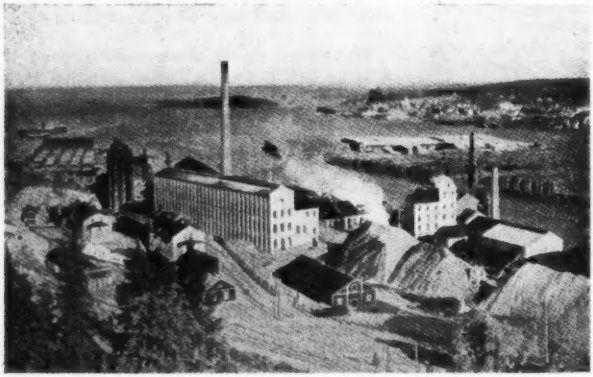
concentrated liquor is either sent to furnaces for burning or to a spray dryer for concentration.

The concentrated liquor is sold in tank cars, or the dried powder in bags for tanning purposes, for ink manufacture, and for other chemical purposes. Its use as a fertiliser is now being investigated. The economics of the process depend first on a cheap ammonia source, and secondly, on a ready market for concentrated waste sulphite liquor of this type.

sending the waste liquor to the evaporators, in which case a low-cost alcohol could be obtained. Some chemists in Scandinavia feel that 10 per cent alcohol is a probability within the next few years.

One of the main difficulties is the use of calcium base in cooking. If the production of alcohol becomes general it would seem likely that there will be a shift to the magnesia or ammonia base method of cooking.

On the basis of Canadian sulphite production of 2,000,000 tons, 40,000,000 gallons



Svartvik sulphite plant of the Swedish Pulp Company at Sundsvaal

Ethyl alcohol is a standard sulphite liquor product in practically all sulphite mills in Sweden, and is also manufactured by pulp mills in Finland, Norway, Germany, Canada, and in the United States. The process depends on the fermentation of the hexose sugars present in the liquor to the extent of about 2 per cent. The general procedure is to separate the waste liquor in the pulp with as little dilution as possible, then the waste liquor is stripped of sulphur dioxide, is cooled to 85°C., neutralised with lime, cooled to 33°C., nutrients added and fermented for 24 to 48 hours. The yeast is recovered and may be re-used. Alcohol yields per ton of pulp vary with the grade of pulp being manufactured and the degree of recovery of the liquor; yields of 20 to 40 imperial gallons of alcohol per ton of pulp have been reported.

Manufacturing costs are said to be below those of potato, molasses, or grain alcohols, but possibly alcohol from petroleum waste gas is lower in production cost. However, if a recovery method such as the magnesia process, or the Norwegian ammonia process, is adopted by the sulphite industry, it should be possible to ferment the waste liquor first and remove the alcohol before

of sulphite alcohol are potentially available in Canada.

In Scandinavia methyl alcohol is also obtained from the process by rectification, and propanol and butanol from the fusel oil fraction. Throughout Norway, Sweden, and Finland an extensive chemical industry based on alcohol from waste sulphite liquor is being constructed, and in some cases is already very highly developed. Acetic acid is manufactured by the fermentation of absolute alcohol as well as by the oxidation process. Among other products are ethylene glycol, crotonaldehyde, ethyl ether, and even vinyl compounds.

Cellulose Products

The development has gone even further in the field of cellulose derivatives. Cellulose glycollate is manufactured from wood pulp and alcohol-based chemicals, and is used as an adhesive, as a stiffening agent, as an egg white substitute, and for other purposes. Ethyl cellulose and hydroxy ethers of cellulose are also being produced.

The principal constituent of sulphite waste liquor is lignin and while much research has been carried on and some advance made in its utilisation, the problem still remains largely unsolved. A typical

analysis of waste sulphite liquor shows:

Total solids	...	10 per cent
Sugars	...	2 ,, ,,
Lignin	...	6 ,, ,,
Sulphur	...	0.8 ,, ,,
CaO ...	...	0.5 ,, ,,

Since lignin is a waste product the primary object of the cooking process is to remove it without destroying the yield and properties of cellulose, and thus we obtain not lignin as such but a dilute solution of lignin derivatives more or less markedly changed and accompanied by other waste compounds. This must be borne in mind when considering the long delay in finding a satisfactory method of sulphite lignin utilisation.

A development of considerable importance has been the preparation of lignosulphonic acids.

Briefly, this process consists of fractional precipitation of the dilute liquor to yield inorganic and organic solid products and a clear process effluent.[4] The inorganic product consists of calcium sulphite which may be re-used to make fresh cooking acid. The organic precipitate is obtained in the second stage treatment and consists of a basic calcium lignin sulphonate which may be burned for its fuel value or utilised industrially. Its utilisation as lignosulphonic acid may be carried out by drying and grinding the calcium salt; it is marketed as a Portland cement fixer, for boiler feed waters, and for use in ceramics.

Effect of Calcium Lignosulphonate

Addition of calcium lignosulphonate to concrete gives a denser flowing mix with less water. It has recently been shown that Portland cement particles suspended in water showed neither Brownian movement nor cataphoresis, but both phenomena appeared when a small amount of lignin derivative was added. Absorption of 0.5 per cent calcium lignosulphonate increased the specific surface of a cement dispersion by nearly 50 per cent.

By converting this calcium lignosulphonate into the magnesium and sodium salts, tanning agents are obtained which are marketed in tonnage quantities. These salts are also successfully used in the manufacture of dispersing agents.

Tanning Liquor

The so-called tanning properties of waste liquor depend on the lignin sulphonic acid present, but there is little definite work regarding the reactions between lignosulphonates and hide substance from which to develop further tanning products. Recent work[5] suggests that the larger molecular weight fractions are more desirable. At the present time, a tanning extract is being manufactured in Canada from sulphite waste liquor by precipitating the lime with sulphuric acid and concentrating the liquor by 55 per cent solids, followed by adjustment of the *p*H value, etc. The iron content of the material must be carefully controlled for best results.

The concentrated whole liquor, both as 50 per cent solids material and as a dry powder, has been known as an article of commerce for the past 50 years. Its use depends largely on the combination of the adhesive properties of the carbohydrates and lignin fractions.

Laboratory investigations carried out at the Ecole Polytechnique in Montreal have shown that the addition of sulphite liquor to a road foundation greatly increases its loading capacity.[6] At moisture contents usually met in practice, the required thickness of a sulphite liquor stabilised mat is

One of the most modern installations for the production of alcohol and nutrients from sulphite liquor is this plant at Hörnefors, among the largest in Sweden

considerably less than that of the ordinary clay-stabilised foundation for the same applied load.

Although the sulphite liquor material is water soluble, after mixing with a light preparation of clay and gravel and drying, the stabilised mixture becomes practically waterproof to capillary water, and in this respect compares well with bitumen products in waterproofing the foundation in contrast with the ordinary clay-sand-gravel stabilisation.

Cheap Adhesives and Paper

The adhesive property of the waste liquor is also utilised in the manufacture of low-cost adhesives, as a core binder in foundry practice, for the manufacture of agricultural sprays, and similar applications. Much research is being carried on to develop a waterproof adhesive from this raw material.

The cellulose residue containing some lignin as it leaves the digester is known as unbleached sulphite and after the proper screening operations is suitable for the manufacture of papers and boards of all types where brightness is not an important specification. For the manufacture of higher grade papers, where a pure white is desired, the pulp is bleached with chlorine or hypochlorite.

The bleaching of sulphite pulp for paper manufacture follows the familiar 2-stage process. The first stage consists of the chlorination in continuous system using rubber-lined towers. Consistencies of 3.5-4 per cent are usually employed and the chlorination agent may be chlorine gas or chlorine water, depending on whether the source of supply is situated at the mill or the reagent is received in tank cars. Washing is carried out on suction or pressure filters of rubber covered or stainless steel construction.

The book and printing paper industries use about 70 per cent of the bleached sulphite pulp produced.

Rayon Pulp Manufacture

In the manufacture of rayon pulp non-cellulosic constituents must be removed from the pulp as completely as possible and for this purpose elaborate multi-stage bleaching systems are employed. The essential step in the manufacture is the caustic purification of the fibre by which hemi-celluloses and other extractives are removed, resulting in an improved alpha cellulose content.

To produce a rayon pulp the wood is cooked to a higher degree than is usually the case with paper pulps, both to reduce the residual lignin to a minimum and to maintain the alpha cellulose content as high as possible.

After the usual screening operations, the pulp may be chlorinated with chlorine water or gas as mentioned previously, followed by the heat treatment with caustic soda in which the partly bleached pulp may be treated with 2-6 per cent of NaOH based on the weight of the pulp, at a temperature of 70-98°C. for 2 to 2½ hours at high consistency, the caustic concentration and the temperature being varied as the requirements of alpha cellulose in the finished product demand.

Under these conditions a finished pulp of alpha cellulose of 89-95 per cent content results. Following the caustic heat treatment the material is washed and given a final bleach with calcium or sodium hypochlorite, usually followed by a sulphur dioxide treatment to reduce the lime content.

A pulp of 96 per cent alpha cellulose content said to be suitable for use in the manufacture of cellulose acetate, cuprammonium, cellulose nitrate, and lacquer bases is produced by a cold treatment with NaOh of 12 per cent concentration, using rayon pulp of 89 per cent alpha cellulose as the starting material.

A pulp of 98 per cent alpha cellulose content for special chemical uses is also manufactured by treating the 96 per cent alpha cellulose with 12 per cent NaOH in the cold on a rotary drum filter.

Sulphate Process

Because of its tremendous growth in the past few years, particularly in North America, the sulphate pulping process now occupies a position of major importance in the pulp and paper industry.

The sulphate process is an alkaline process, because alkalis lost during the cycle of operations are replaced by sodium sulphate. Actually it is sodium sulphide which plays a major rôle in the cooking liquor, this sulphide being derived from the sodium sulphate by reduction during the alkali recovery.

Pulps produced by the sulphate process are characterised by excellent strength and the greatest application of the sulphate process to-day is in making kraft papers. These are exceedingly strong, tough, and ideally suited for wrappings and bags.

The growth of this industry has been particularly rapid in the Southern United States. From a total sulphate production in the United States of 400,000 tons in 1925, the production has grown to over 5 million tons, the industry being even larger than the newsprint industry in Canada. Canada has also shared in the expansion of the sulphate pulping industry, no less than six new mills being in operation or under way, with a potential capacity of over 1500 tons per day.

In the sulphate process chipped wood is cooked for 2½ to 6 hours in steel digesters at a maximum temperature of 170-190°C. and 100 lb. per sq. in. The liquor used

contains approximately 50 per cent NaOH, 30 per cent Na_2, and 15 per cent Na_2CO_3.

As in the sulphite process, directly heated digesters are used; in the newer installations, modern, indirectly-heated digesters are in use and have proved superior to others in steam economy, condensate recovery, and ease of operation.

Since all chemicals used in the cooking process are expensive compared to the sulphite process, elaborate recovery systems are necessary and careful operation and close control of the recovery systems are required for an economic manufacture.

One of the most widely adopted recovery units is the Tomlinson, a unit consisting of a completely water-cooled furnace over which is set a standard B. & W. cross-drum boiler behind which is located a spray tower. Weak liquor from the washers containing about 15 per cent solids is circulated through the spray tower in contact with hot gases from the boiler. It then flows through multiple-effect evaporators where solid concentration is increased to 55 per cent.

Salt cake is added and mixed with black liquor: the mix is sprayed into the furnace under pressure through a nozzle located in the wall. The organic matter in the spray is burnt off and the ash, consisting of sodium salts, falls to the bottom of the furnace from which it flows in a red hot stream to the dissolving tank.

Generally speaking, the heat from the combustion of black liquor is sufficient to produce on the average 40 per cent of the combined steam requirements of the pulp and paper mill.

By-products

During the sulphate cooking process, certain by-products, tall oils, or liquid rosins, are produced and these are being economically utilised in several mills in North America, while in Scandinavia work is continuing on the even greater recovery of these potentially valuable substances.

Crude liquid rosin amounting to 60-90 lb. per ton of sulphate manufactured from pine wood is recovered and this contains about 80 per cent of saponifiable material present as free resin and so-called fatty acids. From this crude rosin, purified tall oil and other important by-products are obtained.

It would appear that the development of by-products from the sulphate industry has reached its highest point in Scandinavia where the fractionated products are used in paint manufacture, coal oils, cable oils, and for soap manufacture.

Since the colour of kraft is brown, its use is limited to those products in which its high strength is of major importance. Its most important application is in bag, wrapping, and container board manufacture.

A most significant development of the kraft picture is the preparation of high white pulps from unbleached sulphate by employing multi-stage bleaching systems, usually from 4 to 7 stages depending upon the colour required in the finished product.

In most instances, bleaching begins with acid extraction or alkaline wash. Following this, chlorination may be repeated or hypochlorite may be used. The fourth stage usually consists of a further hypochlorite bleach followed by a soaking period to remove soluble colouring bodies. A final hypochlorite bleach followed by water washing is then undertaken, and a sulphur dioxide treatment completes the operation. Alkaline extractions are carried out at temperatures between 50° and 90°C., the exact conditions depending entirely on the type of pulp which is required. These reactions are largely carried on in towers equipped for continuous fractions.

Chlorine Consumption

Chlorine consumption for such a process is high and might vary between 130-200 lb. of chlorine per ton of bleached pulp. Lime consumption equals about 65 lb. per ton and caustic requirements are about 100 lb. per ton of bleached product.

The pulp so obtained is used in the manufacture of a variety of white papers including white wrapping, rag papers, folder stock, bond, envelope, and in general those papers which require strength as a foremost quality. Bleached kraft is also used as a base for machine coated papers.

(1) Can. Jour. Research.—B. 15, 457-474 (1937).
(2) Pulp & Paper Mag. of Canada.—45, No. 11 817-820, (October, 1944).
(3) Hill & Campbell.—Developments in Pulp and Paper Manufacture in the Scandinavian Countries. C.P. & P.A. February, 1946.
(4) Howard—Ind. & Eng. Chem. 26, 614 (1934).
(5) Buchanan, Lollar and Niemeyer. The Tanning Properties of Lignosulphonates Produced by Different Cooking Conditions. TAPPI Meeting (February, 1947).
(6) Piette & Demers.—Roads & Bridges. 83, No. 2 70-73, 114-118 (1945).

TURKISH CHEMICAL EXPANSION

THE U.S. Department of Commerce publication *International Reference Service*, No. 45, September, in an economic review of Turkey, refers to the revival of a number of projects envisaged in that country's second five-year plan which took effect from 1938 but was delayed by the war. Tentative plans have been made to extend the chemical industry, such products as nitric acid, nitrates, caustic soda, sodium carbonate, copper sulphate, and carbon sulphide being mentioned. Two additional plants for the manufacture of cement are said to be under consideration.

Demand for Nationalisation

Indian Spokesman Attacks Chemical Companies

A DEMAND that chemical industry in the United Provinces, as one of the vital industries on which depended the future health of the people of the Province, should be nationalised, was made by the Chemical Mazdoor Union of Cawnpore, which gave evidence before the United Provinces Labour Inquiry Committee.

The chemical workers' spokesman argued that since the popular government was embarking on an ambitious programme of health-building, it was necessary to standardise the various vaccines, injections and other medicines produced in the numerous chemical factories in the Province to obtain the maximum results. The chemical and pharmaceutical industry should be the first to be taken under Government control.

The union spokesman went on to allege that, while disproportionate profits were being made, workers were being poorly paid. The minimum, he suggested, should not be lower than Rs.35 per month, and he urged that 30 per cent of " the entire profits of the industry should be distributed to employees as a bonus. He rejected the chairman's reminder that most undertakings in the industry had recorded a loss, citing the case of glass tubes which, he said could be produced at a cost of about A2 and sold for R1-8-0.

There was a tremendous future for the industry if it was well managed. Cawnpore has been selected for the chemical industry not only because it is a big industrial centre but also because the textile mills and the leather industry provide a good market for the many chemicals produced.

Manufacture of Sodium Silicate

Sanction has been accorded by the Dhrangadhra State Government, India, to a private company for the manufacture of sodium silicate, used in making artificial stone and in various industrial processes, chiefly as a filling agent in soap making.

In pursuance of its policy of encouraging infant industries, the Government has offered to exempt the new concern from paying the statutory duty on imports of machinery and building materials, and to permit it to use local stones in the manufacture of sodium silicate free from duty.

The Government has also promised to help the concern in obtaining 30 tons of soda ash every month, if the company starts working within three months and manufactures 90 tons of sodium silicate monthly.

Sulphite Plant for India.—The Swedish Franö sulphite factory has sold its plant to a firm in Calcutta where it will be reassembled by Swedish engineers.

New Source of Plastics

Palestine Develops the Castor Bean

THE castor bean and its disagreeable derivative, castor oil, may become the means by which Palestine chemists can make a going concern of the arid, sand-duned Negev in the south of the country. Scientists working at the Daniel Sieff Research Institute at Rehovot have produced from castor a nylon-like substance which they believe can form the basis of a Palestine plastics industry. From the poisonous residue of the bean they have developed by chemical neutralisation a rich live-stock feed to supplement the country's inadequate grain supplies.

The work has been going forward at the 13-year-old institute for many months. It has included development by natural selection of a castor bean containing up to 60 per cent oil. It is believed that the castor bean will thrive in the Negev if properly cultivated.

Pilot Plant

With colleagues in Palestine and associated scientists in Paris, Dr. Leon Haskelberg, an organic chemist has found a method of breaking down castor oil by chemistry to produce a colourless, odourless material easy to work with. The Institute is at present setting up a pilot plant to make it in quantity for development of commercial uses—thread for textiles, and plastic articles for the home and industry.

Dr. Haskelberg and his team have developed other castor-oil derivatives, among them basic substances for perfumes and insecticides. They hope, in addition to making the development of the Negev possible, to help broaden the country's agricultural and industrial basis.

Clove Oil Outlook

A guardedly optimistic view of the Zanzibar clove oil position is taken by Mr. E. Lyle Pixton, purchasing manager of Monsanto Chemicals, Ltd., who has just returned from a visit to the island on behalf of British vanillin manufacturers, the Colonial Office and the Ministry of Food. Government agricultural scientists in Zanzibar hope to cultivate a dwarf hybrid tree whose cloves could be gathered without wastage. At present the collection of cloves is restricted by the fact that many of them grow inaccessibly on 40-foot trees.

In London last week, Mr. Pixton said :— " The Zanzibar Clove Growers' Association offers reasonable hopes of clove oil being offered in sufficient quantities at a reasonable price. I explained to them quite frankly that unless the present situation improves, British manufacturers of vanillin would have to contact other sources for their raw materials."

American Chemical Notebook

From Our New York Correspondent

A RAPID new process for manufacturing alcohols and other essential industrial chemicals from petroleum has been made possible by a recently developed catalyst which stimulates the conversion of ethylene gas and other compounds of the olefin group so that the entire process takes only a few minutes instead of hours. The new process, which Prof. H. Adkins, of Wisconsin University, has just described in Chicago, has the added advantage of requiring less heat and pressure, he said. It has been customary, heretofore, to treat olefins with carbon monoxide, hydrogen, and a cobalt catalyst to change them to alcohols and other chemicals. In the new process the cobalt is first combined with carbon monoxide and hydrogen to form a complex catalyst which is extremely efficient. All the reactions are carried out under a pressure of about 1450 lb. per sq. in., 100 times normal atmospheric pressure, and the chemicals involved are heated to about 120°C. The complex catalyst is easily regenerated as rapidly as it is consumed, according to Prof. Adkins, making it possible to establish the process on a continuous and semi-automatic basis.

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Mr. Thomas G. Digges has been appointed chief of the Thermal Metallurgy Section of the U.S. National Bureau of Standards, succeeding Mr. D. J. McAdam, who had been chief of the section since 1930 and retired on August 31. Mr. Digges, a member of the Metallurgy Division since January, 1920, is the author of studies on machinability, tool steels, and cutting tools, and work on thermal analysis and critical-cooling rates of high-purity alloys of iron and carbon which established his reputation as a metallurgist He has contributed widely to research and technical journals.

* * *

United States production of inorganic chemicals in September maintained a high level, although lower than the figures for August. Results of the continuous monthly survey of 35 industrial chemicals conducted by the Bureau of the Census, Department of Commerce, show that the national output of 27 chemicals in the group was greater this September than in the corresponding month a year ago, but 22 of the 35 chemicals were below the August level. The lowest production total for any month of the current year was recorded in September for synthetic anhydrous ammonia, ammonium nitrate solution, and nitric acid. Output of these was, however, well above that of a year ago. Compounds showing a lower production in September than in August but above other months of this year and September of last year, include chlorine, hydrochloric acid, phosphoric acid, soda ash, caustic soda, salt cake and sulphuric acid. The production of carbon dioxide (liquid and gas) fell in September after rising steadily since last February. Oxygen production also declined in September, but hydrogen output continued upward to approximately the 1944-45 levels. September production of the chromium chemicals and chrome pigments, except zinc chromate, showed slight gains over August.

* * *

At a recent Detroit meeting of the American Institute of Chemical Engineers, reference was made to the U.S. adaptation of the German Fischer-Tropsch process for the production of synthetic motor fuels. Plans have been drawn up for the erection of two plants to produce liquid fuels from natural gas on a commercial scale. The process may soon be used with coal as the starting material. Several plants using both coal and natural gas are planned by U.S. industry, according to an official of the U.S. Bureau of Mines which has been interested in the manufacture of synthetic fuels for some time. The U.S. contribution to the Fischer-Tropsch technique has been the elimination of the large number of heat exchangers required by the German process, and shortening of the reaction time.

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Nicotine is now being recovered from the exhaust air of tobacco driers, says a report by the Permutit Company of New York. The tobacco is redried before manufacturing operations, and the hot air from the driers contains a small amount of nicotine. By scrubbing this air with water, the nicotine is dissolved out, and by passing the scrubbing water through ion-exchange materials, the nicotine is selectively removed. Although ion-exchange is a well-known operation, new ion-exchange materials and processes are being discovered and the removal of nicotine from the drier exhaust gas is an example of the minute quantities of chemicals it is possible to obtain by this method. The nicotine content of the tobacco leaf varies from 2 to 8 per cent. a figure which permits the recovery of 175 lb. of nicotine a week from 100,000 lb. of tobacco. By chemical treatment of ion-exchange materials, efficient recoveries of nicotine are obtained, after which the ion-exchange materials are put back into operation again.

1500 TON MAGNET

A GREAT apparatus with a 1500 tons magnet for the study of atomic nuclei is to be installed in the Liverpool University, said Sir James Chadwick, Professor of Physics, in a lecture to the University Physics Society. Work on the exterior of the atom was virtually finished, he explained, but the secrets of its nucleus had yet to be solved. The difficulties here were very great, because the particles of the nucleus were so closely bound together; he thought it very likely that the laws of quantum mechanics would apply to the forces between those particles. The cyclotron had made it possible to produce particles with the energy of at least 10,000,000 volts, but in work now waiting to be done, particles of far higher energy levels entered into the matter. If they could get particles with the energy of about 250,000,000 volts, they could expect spectacular advances in nuclear theory. Such machines were being built in America.

Dutch Chemical Process for U.S.

The American Cyanamid Corporation has acquired the right to use a Dutch chemical process obtained from the laboratories of the Dutch State Mines enabling it to conduct large-scale experiments with the carbon washing cyclon. It is suggested that the arrangement will prove an exceedingly profitable one to Holland. First tentative conferences between Dutch and U.S. chemical industrialists were held recently while two leading officials of the Spencer Chemical Co. were visiting the State Mines.

South African Superphosphates

African Exposives and Chemical Industries, Ltd., Johannesburg, write to point out that in an article on South African chemicals (THE CHEMICAL AGE, October 11) the total South African production of superphosphates was underestimated. African Explosives & Chemical Industries, Ltd.—the company writes—are the sole producers of superphosphate in the Union, manufacture being carried out at two points—Umbogintwini in Natal and Somerset West in Cape Province. At present the total capacity of the two factories is about 330,000 tons per annum made up of 150,000 tons at Umbogintwini and 180,000 tons at Somerset West. Production at present proceeds at this rate. Extensions to the Umbogintwini factory will, however, be completed next year, when its capacity will be increased to 320,000 tons per annum. With the maintenance of Somerset West's production at 180,000 tons per annum, the potential annual output of the Union will then be 500,000 tons.

NEXT WEEK'S EVENTS

MONDAY, DECEMBER 8

Society of Chemical Industry (Yorkshire Section and Plastics Group). Chemistry Lecture Theatre, University, Leeds, 6.45 p.m. M. G. Evans: "The Mechanism of Polymerisation."

Chemical Society (Birmingham Section). Main Chemistry Lecture Theatre, University, Edgbaston, 4.30 p.m. W. A. Waters: "Mechanisms of Oxidation."

Royal Institute of Chemistry (Hull and District Section). Royal Station Hotel, Hull, 7 p.m. L. E. Jones: "Patents and the Chemical Literature."

Institution of the Rubber Industry (Midland Section). James Watt Memorial Institute, Great Charles Street, Birmingham, 7.15 p.m. Dr. D. Parkinson: "Newer Developments in Carbon Black."

TUESDAY, DECEMBER 9

Royal Institute of Chemistry (London and S.E. Counties Section). Material Research Laboratory, Philips Lamps, Ltd., New Road, Mitcham Junction, 6.45 p.m. C. G. A. Hill: "Luminescent Materials—Their Properties and Uses."

Institution of Chemical Engineers. Apartments of the Geological Society, Burlington House, Piccadilly, W.1, 5.30 p.m. N. H. Pratt: "The Heat Transfer in a Reaction Tank Cooled by Means of a Coil."

WEDNESDAY, DECEMBER 10

Society of Chemical Industry (Food Group). Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 6 p.m. Five papers on aspects of the food industry.

Institute of Welding (North London Branch). The Technical College, Barking Road, East Ham, E.6, 7.30 p.m. Mr. C. E. Slade: "Developments in Resistance Welding."

Manchester Metallurgical Society. Engineers' Club, Manchester, 6.30 p.m. Ivor Jenkins: "Controlled Atmospheres for Heat Treatment of Metals."

Royal Society of Arts. John Adam Street, London, W.C.2, 2.30 p.m. M. Graham: "Science and the Fishing Industry."

THURSDAY, DECEMBER 11

Chemical Society. Chemistry Lecture Theatre, The University, Liverpool, 4.30 p.m. Professor F. G. Young: "Hormones and Enzyme Action."

Scottish Engineering Students' Association. Institution of Engineers and Shipbuilders, Glasgow, 7.30 p.m. E. G. Yarrow: "Water Tube Boilers."

International Society of Leather Trades Chemists (British Section—Northampton Group). College of Technology, St. George's Avenue, Northampton, 2.30 p.m. J. G. Evans: "Polymers."

Pharmaceutical Society of Great Britain. 17, Bloomsbury Square, W.C.1, 7.30 p.m. Dr. Adrien Albert: "Modern Knowledge of Protein Structure and its Pharmaceutical Significance."

FRIDAY, DECEMBER 12

Scottish Engineering Students' Association. Royal British Hotel, Edinburgh, 7.30 p.m. E. G. Yarrow: "Water Tube Boilers."

SATURDAY, DECEMBER 13

Institution of Chemical Engineers (North Western Branch). College of Technology, Manchester, 3 p.m. C. Toyne: "Heat Transfer in Agitated Pans."

TECHNICAL PUBLICATIONS

"GERMAN Scientific Literature Published during the War" (FIAT Final Report No. 676, 10s. 9d. post free), contains 120 pages and outlines the work done by Signal Corps investigators in the selection and collection of recent unclassified German scientific literature for a reference library. It gives some information on other allied agencies which carried out investigations in this sphere. Furthermore, it gives details about German publishers and the German book trade, about intact libraries, scientific journals and books published during the war. It includes list of some 600 books published since 1939, *inter alia*, one on physical and electro-chemistry. There is another list giving scientific books published by Julis Springer, Berlin.

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The 20-pp. September issue of *Road Tar* published by the British Road Tar Association, contains a report on co-operative research between the D.S.I.R. Road Research Laboratory and the B.R.T.A. on the oxidation of tar and tar fractions, some of which have been chemically treated. The rate of oxygen absorption, and the removal of certain resinous bodies are two subjects touched upon. Comparison of different tars has been carried out by a new oxidation test used in combination with measurement of the brittle temperature by a method based on the "Fraas" test.

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A list of all available publications of the Department of Scientific and Industrial Research is now available free of charge from H.M. Stationery Office, Section S.P., 429 Oxford Street, London, W.C.1. The D.S.I.R. will in most cases endeavour to supply information concerning subjects dealt with, of which the Stationery Office publication is now out of print.

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Among new Government publications included in List No. 288 of H.M.S.O. is "Specification, D.T.D. No. 712, Chromium-Nickel Non-Corrodible Steel Sheets and Coils," 1s. 1d., including postage.

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A list of inventions for which the U.S. Government holds the right to file foreign patent applications has been issued by the office of Technical Services, Department of Commerce, Washington. The inventions include production of charcoal and its by-products, melting of halnium, zirconium and titanium, silver plating, magnesite froth flotation, etc.

A guide to clear, and up-to-date information concerning a large section of the wide range of chemical plant produced in Britain today, is "British Chemical Plant" published by the British Chemical Plant Manufacturers' Association. Containing 212 well illustrated pages, this directory-guide must inevitably arouse the interest of those who require to know of developments in one or other of the specialised departments of chemical industry and appreciate an opportunity of seeing the plant as it actually appears.

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"Fuels for Oil engines." This British Standard (B.S. 209 : 1947) now available from the Sales Department, British Standards Institution, 24 Victoria Street, London, S.W.1 (7s. 6d. post free), is a revision of the 1937 edition and embodies the alterations that have been found necessary or desirable in view of the great developments that have taken place in engines, fuels and methods of testing since 1937. The standard, which covers petroleum and shale fuels for oil engines, now permits the use of additives in the fuel, but it does not yet cover fuel oils derived from coal because there is not yet sufficient data to permit correlation of specification requirements and the engine performance of the type of fuel. Two classes of fuel are now specified in detail: they correspond closely with those called in the 1937 edition "High-speed Diesel Fuel" and "Marine and Industrial Diesel Fuel." The methods of testing now include determination of octane number, kinematic viscosity, carbon residue, recovery from distillation at 350°C., flash point, gross calorific value, acidity, content of water, ash, sediment, and sulphur and a copper strip correction test.

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Collated information on the subject of "Aerosols" is not always readily available, though scattered and sometimes inadequate articles make infrequent appearances in the technical Press. "Aerosols in Theory and Practice," by A. C. Lock, originally published in 1944 by Aerosols, Ltd., and now republished is, therefore, a welcome reappearance. There are 59 pages of text—the publishers appear to have formed the opinion that the subject does not lend itself to illustration, a viewpoint that not all will share—devoted to the history, physics, production and application of Aerosols, as well as comprehensive chapters dealing with the destruction of bacteria, inhalation therapy and insecticides.

Home News Items

Monsanto Fire.—Serious fire damage at the Monsanto Chemical Works, Cefn Mawr, last week, was narrowly averted by the prompt action of the works fire brigade. When the local N.F.S. brigades arrived, the works brigade had brought the flames under control.

Atom Progress at Harwell.—According to Prof. P. B. Moon, secretary of the Atomic Scientists' Association, Britain's first small-scale atomic pile at the Harwell research station, near Didcot, Berks, is producing "perhaps enough heat to run one electric fire."

Trophy for Port Sunlight Players.—At the Unilever Drama Festival, held on November 29 at Port Sunlight, the Leverhulme Trophy was awarded by a professional adjudicator to the Port Sunlight Players for their presentation of Priestley's "The Rose and Crown."

Mullards' Power-Warning System.—A system by which Mullard Radio Valve Co., Ltd., at Mitcham, maintains its consumption of electricity within pre-arranged limits, resembles the "raiders overhead" warning of the war years. In the power control room an operator watches a dial registering kilowatt consumption. When the needle swings to 1560 kWh or over, he presses a switch which sounds a three-pip warning throughout the factory.

Sulphuric Acid in Sea Mishap.—Six of the crew of the Limerick Steamship Company's ship *Monaleen* (638 tons), had narrow escapes on November 25 when sulphuric acid fumes swept the ship while they were asleep in their bunks. The ship was rounding Loophead, off the West Coast of Ireland, in heavy seas, bound for Galway from Liverpool, when deck-stored glass jars were smashed and the acid percolated to the engine room. Six of the crew of 14 were found to be suffering from the effects of inhaling sulphuric acid gas and one was seriously ill.

Vacation Work Scheme.—The scheme for voluntary vacation work, which the Imperial College of Science and Technology has been organising for some years as an adjunct to the college's theoretical and practical training, received 467 registrations in 1945, 586 in 1946, and this year's figure was 705. Commenting upon these figures, the college's 13th annual report says that although these increases cannot be maintained, it is nevertheless gratifying to find so many students availing themselves of these opportunities.

U.K. and Holland—Better Communications.—A new coaxial cable laid between this country and Holland will permit 84 simultaneous conversations. It is the first cable of its type to be laid for commercial use.

Mine Detectors for Disposal.—Service mine detectors, weighing 15-20 lb., are available for disposal from the Directorate of Disposals, Ministry of Supply. Under suitable conditions, metal can be detected within a range of about 18 inches and the appliances could be employed in industrial processes.

Better Coal Output.—The rising rate of production in the coalfields is indicated by the fact that output last week rose to 4,263,200 tons, 17,900 tons better than the previous week, in spite of stoppages in Scotland. Current output is about 400,000 tons more than last year.

Chemistry of Waxes.—A course of eight lectures entitled "The Modern Chemistry and Technology of Waxes" for post-graduate students, industrial chemists and others is to be given at Chelsea Polytechnic on Friday evenings at 7.30 p.m., commencing January 16, 1948. The lecturer will be Dr. Leo. Ivanovszky, and the fee for the course 10s. Applications for enrolment should be made to the Principal, Dr. F. J. Harlow.

Flame-proof Switchgear

Approval has been given by the Ministry of Fuel, following standardised tests, to the flame-proof enclosed electrical switch and fuse unit now being produced by Brookhirst Switchgear, Ltd., Chester. The unit, rated at 15/30 amps. and suitable for voltages up to 500, consists of a main enclosure for switch and fuses with connecting chambers for the leads top and bottom provided with insulating and flame-proof bushes. It is adapted for safe use in inflammable atmospheres.

Polish Chemical Output

The output (in tons) of the chemical industry in Poland, in September, was as follows: Tar products 14,668, benzene products 2759, carbon electrodes 509, organic dyestuffs 192, oil paints and varnishes 426, zinc oxide 704, ultramarine 61, potassium nitrate 10,267, saltpetre fertilisers 3605, superphosphates 17,195, hydrochloric acid 199, sulphuric acid 4804, ammonia 510, acetylene 2130, ammoniacal soda 7649, soap 780, rubber footwear 130, tyres and tubes 319, emery wheels 30.

PERSONAL

PROF. P. KUIN, Secretary-General of the Dutch Department of Economic Affairs, has resigned. He is to join the Unilever group as economic adviser.

MR. WILLIAM WOOD, general manager of Thos. W. Ward (Coal) Longbottom, Ltd., Sheffield, has been appointed assistant managing director.

MR. MAX KLEEMANN who was a deputy-chairman and joint managing director of O. and M. Kleeman, manufacturers of plastic materials, left £393,563, net personalty £390,426.

MR. J. K. REDMAN, of the technical department, Gloster Aircraft Co., Ltd., has been appointed chief technician to the Dunlop Rubber Company's aircraft division at Foleshill, Coventry.

MR. J. H. MERRICK has been appointed representative in the North-East of England for E. Boydell & Co., Ltd., manufacturers of mechanical handling equipment. The appointment is consequent upon the death of MR. J. L. LOE.

MR. E. A. LANGHAM, the British Aluminium Co.'s sales manager, has been appointed general manager of the India branch of the company and has already left this country. MR. A. W. LANGHAM, who has been manager of the sales planning department, will, for the present, also be in charge of the sales division.

MR. R. W. PEARMAN, of Bexleyheath, Kent, has been appointed to the Colonial Service as a chemist in the Department of Chemistry of Singapore and the Malayan Union. His qualifications include A.R.C.S., A.R.I.C. He has held appointments in the Government Chemist's Department, London, Mullards Radio Factory, Mitcham, and the Imperial Institute, South Kensington.

SIR FRANK ENGLEDOW has been appointed chairman of the Food Investigation Board, D.S.I.R., in succession to the late Sir Joseph Barcroft. Sir Frank, who is Draper's Professor of Agriculture at Cambridge, is 57, and has investigated methods for determining the yielding capacity of farm crops.

Textile Institute Fellows

Two new Fellows have been elected to the Textile Institute. They are: MR. J. BOYD, of Flixton, Manchester, who has been an associate of the Institute since 1943; his election to Fellowship at the age of 29 makes him one of the youngest of the Institute's Fellows; and MR. SRINAGABHUSHANA, B.Sc., professor in textile technology and acting principal at the Shri Krishnarajendra Silver Jubilee Technological Institute, Bangalore.

MR. HUGH F. HOLGATE, of Shipley, near Bradford, senior assistant chemist at Valley Power Station, Bradford, since May, 1944, is to become chief chemist at Belfast power station. The appointment is subject to confirmation by Belfast City Council. Thirty-one years of age, Mr. Holgate was educated at Bingley Grammar School and Leeds University, where he took a science degree in gas engineering. At a later stage in his career he became a fuel technologist with General Refractories, Ltd., Worksop.

Officers of the Royal Society

At the 285th anniversary meeting of the Royal Society in London on Monday, the following were elected as officers and council for the ensuing year: President, Sir Robert Robinson; treasurer, Sir Thomas Merton; secretaries, Sir Alfred Egerton, Sir Edward Salisbury; foreign secretary, Prof. E. D. Adrian; other members of council: Prof. J. D. Bernal, Prof. W. Brown, Prof. S. Chapman, Prof. A. C. Chibnall, Prof. C. A. Lovatt Evans, Prof. W. E. Garner, Prof. A. C. Hardy, Sir Norman Haworth, Prof. H. D. Kay, Dr. C. H. Kellaway, Prof. M. L. E. Oliphant, Dr. C. F. A. Pantin, Prof. H. H. Read, Dr. A. E. Trueman, Mr. B. N. Wallis, Dr. J. H. C. Whitehead.

Derbyshire Stone Appointments

MR. CLIFFORD GREENHOUS, Derbyshire Stone group's senior representative in Manchester and South-East Lancashire, has been appointed to the board of Hardamac, Ltd., a subsidiary company. MR. GEORGE HENDERSON and MR. J. A. A. SPRING have joined the board of Constables (Matlock Quarries), Ltd., another subsidiary. Mr. Henderson has been closely associated with the company since its incorporation. Mr. Spring, who is a director of Ragusa Asphalte Paving Co., Ltd., has had close business connections with the company. Other subsidiary company board appointments are: Mr. C. E. HIBBERD to Hadfields (Hope & Caldon Quarries), Ltd.; MR. FREDERICK MACDONALD to Greatorex & Son, Ltd.

Obituary

MR. C. W. KAYSER, a leading Sheffield steel manufacturer, who last year resigned his post of chairman and managing director of Kayser Ellison & Co., has died at Eaton, Notts.

The death occurred this week at the age of 71 of MR. SAMUEL COURTAULD, who until his retirement last year was chairman for 25 years of Courtaulds, Ltd., the pioneers of viscose spinning. He was a munificent patron of technical education and of art.

Overseas News Items

Oil Survey in Persia.—Hunting Aerosurveys is to carry out an aerial oil survey of 10,000 square miles of Persia on behalf of Anglo-Iranian Oil Co.

Courtaulds and U.S. Viscose.—The wartime agreement between Courtaulds and the American Viscose Corporation, which provided for the exchange of technical information on rayon research developments, is reported to have ended on December 4.

New Synthetic Resin Plant.—To supply their paint, varnish and lacquer plants in California, the Sherwin-Williams Company has established, at a cost of $400,000, a new synthetic resin installation at its Emeryville factory. Two 1000-gal. jacketed resin kettles, clad with stainless steel, are capable of processing rapidly small or very large batches of alkyd resin solution or oil. Four-speed agitators enable widely varying materials to be processed.

Better Tin Prospect.—Australian tin mining companies with interests in Siam do not expect the political upheaval in that country to interfere with their rehabilitation plans. Some Australian mining engineers are already in Siam and more are on their way to Bangkok. Mining experts predict that Siam tin mines will produce about 6000 tons this year, increasing to 13,000 tons next year, and returning to the pre-war level of 17,000 tons by 1949.

French Oil Refinery for Lebanon.—The Compagnie Française des Pétroles, through which France participates in the exploitation of the oil fields of Iraq, is reported to have obtained a 70-year concession from the Lebanese Government for the erection of an oil refinery—probably at Tripoli. While the French company has been exempt from the payment of all Lebanese taxes and duties, it has agreed to pay 2640 piastres for every 1000 tons of oil if the proposed refinery's output does not exceed 2 million tons per annum.

15-Year Aluminium Agreement.—A recent statement by the Norwegian Ministry of Commerce reveals that the newly concluded Norwegian-Canadian aluminium agreement will guarantee delivery of Canadian aluminium oxide for the new Norwegian Aardal plant for a period of 15 years. In return, Norway will ship 30 per cent of the finished aluminium to Canada. Original plans for the Aardal works, as envisioned by the German builders, included an oxide plant, which is now to be used for the electro-smelting of pig iron.

New U.S. Metal Coating.—A coating which protects metal against vapour, moisture, gases, etc., has recently been developed by the Arco Company of America. It is claimed to provide weather protection for about ten years.

Largest Aspirin Plant.—Said to be capable of producing 60 per cent of current American requirements of aspirin tablets, the new $2½ plant of the Bayer Company (Sterling Drug, Inc.) at Trenton, New Jersey, is stated to be the most modern and largest in the world.

Rubber Factory for Palestine.—A £60,000 factory recently established at the communal settlement of Kfar Saba, Palestine, for the manufacture of rubber products, uses waste rubber and gives employment to 40 settlers. It produces rubber soles and heels, cycle accessories, rubberises wheels and cylinders, and retreads tyres as well as producing a number of smaller domestic and industrial articles.

Another Penicillin Salt. — Most recent American development in the penicillin field is the production by Chas. Pfizer & Co., New York, of a new penicillin salt, procaine penicillin, a crystalline water insoluble salt of the local anæsthetic procaine combined with penicillin. A single intramuscular injection in man of 300,000 units of procaine penicillin in oil is said to produce detectable penicillin blood levels lasting 24 to 48 hours.

Safety Data of Phosphorus.—The Manufacturing Chemists' Association of the United States has just released Chemical Safety Data Sheet SD-16 on "Phosphorus, Elemental," the sixteenth in the series of chemical product safety manuals being prepared by them. Designed for supervisory staffs and management, the manual lists physical and chemical properties of the product, contains shipping and container and handling information and recommends personal protective equipment.

U.S. Instrument Fair.—The Third Instrument Conference and Exhibition of the Instrument Society of America is to be held in the Convention Hall, Philadelphia, from September 13-17, 1948. The exhibition is to be known as the American Instrument Fair, of which the highlight will be an historical display of instruments. Co-sponsors of the Fair are the American Institute of Physics, American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

PESTCURE, LTD., London, S.W., manufacturing chemists. (M., 6/12/47.) October 30, £1000 debenture, to G. H. Evans, London, general charge.

Company News

The offer by the **Beecham Group, Ltd.**, of 1,500,000 4½ per cent redeemable cumulative preference shares at £1 each (at par) last week was heavily oversubscribed.

Change of Address.—**Burroughs Wellcome and Co.** announces that as from December 22 the address of its bulk chemical section will be 183-193 Euston Road, London, N.W.1 (telephone: EUSton 4477).

The nominal capital of **M. E. Dougherty, Ltd.**, dealers in synthetic resin, coal tar and petroleum products, chemical merchants, etc., 27 Albemarle Street, London, W.1, has been increased beyond the registered capital of £1200 by £4800 in £1 ordinary shares.

British Tar Products, Ltd. has declared a final dividend of 19 per cent on the ordinary shares for the year ended September 30 last, bringing this year's total payments to 25 per cent as against 22 per cent for the previous year.

New Companies Registered

British Permanent Starch Co., Ltd. (445,515).—Private company. Capital £1000. Manufacturing chemists, etc. Subscribers: R. Detsinyi and N. Alexander. Reg. office: 12 Henrietta Street, W.C.2.

Aldar Products, Ltd. (445,564).—Private company. Capital £100. Manufacturers and merchants of chemical compounds, preparations, manufacturing chemists, drysalters and distillers, etc. Reg. office: 100-2 Woodhouse Road, Leytonstone, E.11.

Stanley Elmore Co., Ltd. (445,447).—Private company. Capital £56,250. Metallurgists, electro-metallurgists and industrial chemists, etc. Directors: J. A. Stocker and P. E. Mann. Reg. office: Salisbury House, London Wall, E.C.2.

British Aromatics, Ltd. (445,514).—Private company. Capital £10,000. Aromatic chemicals, solvents, fine chemicals, dyestuffs, pigments, etc. Directors: E. S. Stanley and L. H. Stanley. Reg. office: Deansgate Chambers, 32 Deansgate, Manchester.

A. D. Howlett, Ltd. (445,090).—Private company. Capital £100. Manufacturers of chemicals and chemical compounds, etc. Directors: A. D. Howlett and J. P. Mell. Registered office: Cree House, Creechurch Lane, E.C.

Regency Chemicals, Ltd. (445,547).—Capital £100. Manufacturers of and dealers in pharmaceutical, medicinal, chemical, industrial and other preparations and articles, etc. Subscribers: G. E. Brierley and N. F. Taylor. Reg. office: 462 Fulham Road, S.W.6.

Sheen Instruments, Ltd. (445,493).—Private company. Capital £3000. Mechanical and electrical engineers, vendors of scientific instruments, apparatus and motors, etc. Directors: E. E. Jelpke and G. A. Herbert. Reg. office: 12 Temple Sheen Road, S.W.14.

Hope Hartope & Co., Ltd. (445,003).—Private company. Manufacturers and refiners of and dealers in all kinds of oils and oleaginous substances, tars, acids and other chemicals and chemical products, etc. Directors: R. H. King and J. W. Graham. Reg. office: Finsbury House, Blomfield Street, E.C.2.

Chemical and Allied Stocks and Shares

THE feature of stock markets has been the reaction which followed news of Britain's £48 million gold sale to the United States and the purchase of 60 million dollars from the International Monetary Fund. This sale exceeded estimates and indicates the serious position which must persist until the export drive and Sir Stafford Cripp's austerity programme can check the drain on dollar resources. The Government White Paper on the £180 million "cut" in capital expenditure contained few surprises, but makes it clear that many companies confined to the home market must face reduced earnings.

On the other hand, shares of companies well placed in regard to export trade priorities have received further attention this week. After opening strongly under the influence of the cash repayment decision in respect of 3 per cent Conversion Loan, British Funds reacted sharply sentiment being unsettled by the gold sale to the U.S. The market is now almost unanimous in its view that the £1000 million of British Transport stock to be

issued on January 1 will have to carry higher interest than 2½ per cent.

Chemical and kindred shares were mostly higher where changed, buyers being attracted by the scope for export trade expansion. Moreover the market view is that in many cases, if trading profits are maintained, net profits may be higher because the end of E.P.T. may more than offset the doubling of the Profits Tax. On the other hand, it is realised that under existing conditions the tendency will be to add larger sums to reserve funds, so that it cannot be assumed that higher net profits will mean increased dividends.

Imperial Chemical were 50s. and market talk of an increase in the forthcoming dividend advanced Turner & Newall to 85s. at one time. British Aluminium have been firm at 50s. with Borax Consolidated 54s. 4½d., hopes of higher dividends also persisting in these cases. Units of the Distillers Co. were 29s. 6d. at which the yield is approximately 3½ per cent, while United Molasses were 51s. 6d., yielding over 4½ per cent.

In other directions, British Plaster Board have strengthened to 24s. 3d. at which these 5s. shares yield over 5½ per cent assuming the 25 per cent dividend is maintained. The slowing down of housing is an adverse factor, but it is possible the company can develop export trade. Paint shares have strengthened, with Lewis Berger £9⅛ in anticipation of the pending results creating an excellent impression. Goodlass Wall 10s. ordinary were 40s. 7½d. International Paint £6⅜ and Pinchin Johnson 10s. ordinary 61s. 6d.

B. Laporte were 83s. 9d. and W. J. Bush 82s. 6d., with Fisons active around 67s., and Lawes Chemical 10s. ordinary have been firm at 14s. following publication of the annual report. Glaxo Laboratories eased to £23¼, British Drug Houses 5s. shares were 13s. 9d., and British Glues & Chemicals 4s. ordinary have been firm at 22s. 6d. Iron and steel shares were mostly better on balance, although best levels were not fully held, Stewarts & Lloyds being 56s. 10½d., Guest Keen 48s., and United Steel 26s. 9d., but South Durham Steel eased to 28s., the results showing reduced trading profits. Babcock & Wilcox were good at 74s. 3d., and T. W. Ward rose further to 55s. Lautaro Nitrate gained 1s. 3d. at 33s. 6d., in response to the revised estimate of world nitrogen production and consumption. In other directions, Boots Drug strengthened to 60s. 3d., and Lever & Unilever to 54s. 4½d. Beechams deferred at 21s. 9d. were firm on the huge success of the offer of £1,500,000 4½ per cent preference shares at par, applications exceeding £40,000,000. Oils remained active with Shell higher at 78s. 9d. following the meeting called to sanction the big capital increase.

British Chemical Prices

Market Reports

THE industrial chemicals market has again followed a steady course and no important changes have been reported during the past week. The demand in most sections is sufficient to take care of available supplies, and export business continues to be maintained at a satisfactory level. Values generally are well held, and the undertone of the market is very firm. Increasing demand for dyestuffs, particularly for shipment, is reported, and the call for textile chemicals and paint raw materials has been brisk. The container situation shows no sign of improvement, and is a handicap to traders in their efforts to meet export orders. There have been no new features in the coal-tar products market, and production has a good deal of leeway to make up. Pitch continues to be in active request, and fair quantities are reported to be going for shipment.

MANCHESTER.—Steady trading conditions have been reported on the Manchester market during the week in respect of both light and heavy chemical products. Leading industrial users of soda ash and other alkali products in Lancashire are pressing for deliveries due under current orders and this is also the case in the general run of potash compounds that are on offer and to most of the magnesia and ammonia products. Fresh home and shipping inquiries during the past few days have been fairly numerous. Meanwhile, quotations generally are on a steady to firm basis. Some of the fertiliser materials are meeting with a good demand, and a steady absorption of supplies of pitch, crude tar, creosote and other heavy oils, and most of the light distillates is reported in the tar products section.

GLASGOW.—There has been considerable interest over the whole range of chemical products in the Scottish chemical market during the past week. Materials which have naturally been in heavy demand as a result of the colder weather are calcium chloride, and anti-freeze preparations with either a glycerine or ethylene glycol foundation. Nothing like sufficient quantities of these materials are available. The damage which has already resulted to water-cooled engines, which must amount to a very considerable sum and will lead to heavy capital outlay, suggests that it might have been wiser if more of the necessary raw materials had been available for the producers of anti-freeze preparations. In the export market, there has been heavy demand for copper sulphate and potassium nitrate. There has also been a steady demand for bleaching powder and trisodium phosphate.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Preparation of titanium dioxide.—Pittsburgh Plate Glass Co. April 4, 1941. 9939/1944.

Dialkyldihydroxydiphenyl hexadiene.—Reed & Carnick. Feb. 26, 1944. 21850/1947.

Catalytic contact masses.—O. Reitlinger. March 4, 1946. 5031-32/1947.

Process of producing a solid ethylene polymer and the product resulting therefrom.—Standard Oil Co. March 5, 1946 6108/1947.

Process of synthesising hydrocarbons.—Standard Oil Co. April 24, 1941. 21865/1947.

Process of synthesising hydrocarbons.—Standard Oil Co. Oct. 11, 1944. 21978/1947.

Process and apparatus for the pyrolysis of organic compounds.—Tennessee Corporation. Sept. 29, 1943. 21967/1947.

Process for the conversion of isoparaffinic hydrocarbons into higher boiling derivatives thereof.—Universal Oil Products Co. May 9, 1942. 13918/1947.

Magnetic induction accelerator with small X-ray source.—Board of Trustees of University of Illinois. May 4, 1944. 13624/1945.

Welding alloys.—R. Wassermann. Nov. 13, 1940. 22356/1947.

Silver alloys.—R. Wassermann. March 22, 1941. 22357/1947.

Production of magnesium oxychloride cementitious compositions. — Westvaco Chlorine Products Corporation. Sept. 1, 1945. 21849/1947.

Therapeutic solutions.—Abbot Laboratories. March 9, 1942. (Cognate application 21464/1947.) 21463/1947.

Manufacture of oxazolidine-2. 4-Dione therapeutic products.—Abbot Laboratories. July 18, 1941. 22163/1947.

Glassy phosphate powder compositions and process of making the same.—Albright & Wilson, Ltd. Feb. 28, 1946. 5819/1947.

Glassy phosphate powder compositions and process of making same.—Albright & Wilson, Ltd. Feb. 28, 1946. 5820/1947.

Process and apparatus for the manufacture of rayon.—Algemeene Kunstzijde Unie N.V. Feb. 27, 1946. 1379/1947.

Improved method of removing iron from ceramic raw materials.—American Official Co. March 12, 1943. 21344/1947.

Flame-retarding material and method of making the same.—American Viscose Corporation. Feb. 20, 1946. 37820/1946.

Metal-phenol-nitrogen compounds.—Bakelite Corporation. Feb. 27, 1946. 5038/1947.

Steel and the manufacture thereof.—Bethlehem Steel Co. Feb. 28, 1942. 21367/1947.

Processes of polymerisation.—A. Brasch. May 7, 1942. 20464/1947.

Sterilisation of non-edible substances and objects.—A. Brasch. May 7, 1942. 20467-68/1947.

Manufacture of organic compounds.—British Celanese, Ltd. Aug. 19, 1943. 15864/1944.

Production of insulating materials.—British Celanese, Ltd. Feb. 3, 1943. 21680/1947.

Process of producing dicarboxylic acid anhydrides.—California Research Corporation. May 30, 1945. 21728/1947.

Production of dicarboxylic acids or anhydrides thereof.—California Research Corporation. May 30, 1945. 21729/1947.

Esters of polyoxyalkylene diols and methods of making such esters.—Carbide & Carbon Chemicals Corporation. Feb. 26, 1946. 2999/1947.

Manufacture of new semi-esters of dicarboxylic acids.—Ciba, Ltd. Feb. 27, 1946. 4662/1947.

Manufacture and use of new monoazo-dyestuffs.—Ciba, Ltd. Feb. 27, 1946. 4989-90/1947.

Drying of articles, particularly rubber articles.—Firestone Tyre & Rubber Co. Feb. 21, 1946. 141/1947.

Production of polymeric resins.—Firestone Tyre & Rubber Co. April 12, 1944. 21602/1947.

Polymerisable vinyl resin composition and method of forming same.—B. F. Goodrich Co. Dec. 22, 1938. 20263/1947.

Polymerisation of vinyl halides.—B. F. Goodrich Co. March 28, 1941. 21523/1947.

Insectides.—Harvel Corporation. May 3, 1939. 21500-51/1947.

Reaction products of styrene and anacardic materials.—Harvel Corporation. Feb. 9, 1940. 21502-3/1947.

Compositions of matter and methods and steps of making and using the same.—Harvel Corporation. Jan. 23, 1940. 21504-5/1947.

Petroleum oils.—Harvel Corporation. Dec. 5, 1945. 21506-9/1947.

Nitrogen containing derivatives of tetrahydrocardanol.—Harvel Corporation. March 31, 1945. 21510-11/1947.

Compositions of matter.—Harvel Corporation. July 26, 1939. 21512-14/1947.

Compositions comprising synthetic rubber and anacardac material.—Harvel Corporation. June 27, 1944. 21515/1947.

Compositions of matter and methods, and steps of making and using the same.—Harvel Corporation. May 26, 1939. 21516/1947.

Process for the separation of cashew nut shell liquid from cashew nuts.—Harvel Corporation. Feb. 18, 1939. 21517/1947.

Anacardic material reaction products.—Harvel Corporation. Aug. 25, 1945. 21518/1947.

Distillation of anacardic materials.—Harvel Corporation. Nov. 10, 1939. 21519/1947.

Anine, aldehyde condensation products.—Harvel Corporation. March 13, 1941. 21520/1947.

Method of making furfuryl alcohol resinous products and the resulting products.—Havel Corporation. Nov. 24, 1943. 8168/1945.

Gas purification process.—Koppers Co., Inc. Aug. 17, 1944. 95/1946.

Process for the recovery of phenols.—Koppers Co., Inc. May 3, 1944. 96/1946.

Refining of phenothiazine.—Koppers Co., Inc. June 22, 1944. 184/1946.

Pyridine recovery process.—Koppers Co., Inc. Dec. 16, 1941. 428/1946.

Gas purification apparatus.—Koppers Co., Inc. Aug. 29, 1944. 4411/1946.

Obtaining valuable light-oil fractions from fuel distillation.—Koppers Co., Inc. Nov. 21, 1942. 4412/1946.

Gas purification process.—Koppers Co., Inc. Aug. 17, 1944. 4413/1946.

Method of producing a composite resin and products thereof.—Koppers Co., Inc. Dec. 3, 1942. 21361/1947.

Adhesive carries films.—Koppers Co., Inc. Dec. 3, 1942. 21363/1947.

Methods and apparatus for the surface hardening of ferrous metal bodies.—Linde Air Products Co. Oct. 5, 1942. 16764/1943.

Production of dimeric esters of crotonic acid.—Lonza Elektrizitatswerke und Chemische Fabriken A.G. May 30, 1944. 21282/1947.

Method of treating a polymerisable alkyl resin, and the polymerisable material resulting therefrom.—Marco Chemicals, Inc. Jan. 29, 1944. 21390/1946.

Formation of aliphatic carboxylic acid esters of lignin material.—Mead Corporation. Feb. 13, 1943. 21849/1943.

Production of hydrides of alkaline earth metals.—Metal Hydrides, Inc. July 1, 1941. 16805/1945.

Lubricating compositions. — Monsanto Chemical Co. Feb. 26, 1946. 5108/1947.

Lubricants. N.V. de Bataafsche Petroleum Maatschappij.—Jan. 15, 1943. 21285 1947.

Process for the production of diketones. —N.V. de Bataafsche Petroleum Maatschappij. July 18, 1944. 21284/1947.

Stabilisation of unsaturuated ketones.—N.V. de Bataafsche Petroleum Maatschappij. March 13, 1945. 21285/1947.

Process for the production of unsaturated carbonylic compounds.—N.V. de Bataafsche Petroleum Maatschappij. Feb. 22, 1943. 21286/1947.

Pyrclosis of unsaturated ethers.—N.V. de Bataafsche Petroleum Maatschappij. March 10, 1941. 21439/1947.

Convertible alkyd resins.—N.V. de Bataafsche Petroleum Maatschappij. June 15, 1943. 21741/1947.

Chemical compounds and processes of preparing the same.—Merck & Co., Inc. March 22, 1946. 7004/1947.

Chemical compounds and processes of preparing the same.—Merck & Co., Inc. March 22, 1946. 7005/1947.

Synthesis of penicillin.—Merck & Co., Inc. March 23, 1946. 7006/1947.

Purification of streptomycin.—Merck & Co., Inc. March 20, 1946. 7325/1947.

Processes for producing resinous material and the resinous material resulting therefrom.—Monsanto Chemical Co. March 20, 1946. 7676/1947.

Process for producing a coating composition and the coating composition resulting from said process.—Monsanto Chemical Co. March 29, 1946. 8227/1947.

Process for the sulphochlorination of substituted or unsubstituted saturated hydrocarbons, or hydrocarbon mixtures consisting entirely or substantially of saturated hydrocarbons.—N.V. de Bataafsche Petroleum Maatschappij. March 22, 1946. 5490-91/1947.

Process for the manufacture of dicyclohexylammonium nitrite.—N.V. de Bataafsche Petroleum Maatschappij. March 26, 1946. 5713/1947.

Manufacture of substantially anhydrous sodium soap lubricating greases.—N.V. de Bataafsche Petroleum Maatschappij. March 20, 1946. 7740/1947.

Modified lead sulphate pigments and the process of manufacturing.—National Lead Co. March 27, 1946. 6893/1947.

Dispensing liquid chemicals.—Prel, Inc. March 22, 1946. 21589/1947.

Process of manufacturing sulphuric acid. —Soc. Anon. des Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny et Cirey. March 29, 1946. 8505/1947.

Alkylated thiophene compounds and production thereof.—Texaco Development Corporation. March 21, 1946. 5971/1947.

Process for the preparation of oximes from cyclic ketones.—Algemeene Kunstzijde Unie N.V. March 5, 1946. 33847/1946.

Alkamine esters of 1-dialkylamindalkylpyrrole-3, 4-dicarboxylic acids.—American Cyanamid Co. July 31, 1943. 11913/1944.

Acrylonitrile and the production therefrom.—American Cyanamid Co. March 19, 1946. 6327-9/1947.

Treatment of cements by carbon dioxide and its combinations.—R. M. Berthier. Feb. 13, 1945. 24722/1947.

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

A VACANCY occurs in the tendering and projects department of Bamag Limited, Rickett Street, S.W.6. Candidates with a knowledge of chemical engineering practice and/or the oil and fat industry will be preferred. Salary according to age and experience. Write to the COMPANY SECRETARY.

ANALYTICAL CHEMIST required for works in East London area. Experience in the analysis of non-ferrous metals necessary. B.Sc. or equivalent degree, and age about 30, preferred. Reply Box No. 2563, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4, stating approximate salary.

CEREBOS LIMITED require two qualified Assistant Chemists for their factory in the North East of England for technical development and routine analysis. The senior of these appointments requires some previous industrial experience and in both cases assistance may be given in connection with the housing problem. Contributory pension scheme. Salary from £375 to £500 per annum, according to qualifications and experience. Applications, giving full details of age, education, qualifications, experience, etc., to Manager, CEREBOS LIMITED, Greatham, via Billingham-on-Tees, Co. Durham.

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JUNIOR Assistant, inter-standard, required for works laboratory, 15 miles S.E. London. Preferably two or three years' practical experience. Work partly analytical, and assisting research on wide range of topics. Box No. 2556, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

LARGE Petroleum Company has vacancy for girl to take charge of filing, abstraction of scientific journals and dealing with journals and reports required for technical and economic studies. Applicant should have a degree in chemistry with some knowledge of library and filing techniques. Write Box ZY. 916, DEACONS ADVERTISING, 36, Leadenhall Street, E.C.3.

LARGE Petroleum Company has vacancy for girl for work including preparing of technical summaries and maintaining technical records. Applicant should have chemistry degree. Write Box ZZ. 917, DEACONS ADVERTISING, 36, Leadenhall Street, E.C.3.

PROJECT ENGINEER: for the study of new processes, preparation of plant schemes and chemical engineering design. Applicants should be graduate Chemical Engineers with experience of plant design and operation and knowledge of estimating capital and operating costs.

ASSISTANT MAINTENANCE ENGINEER: for supervision of maintenance and construction in section of a large chemical works. Applicants should preferably have served an engineering apprenticeship and have had experience of plant maintenance in a heavy chemical or similar type of factory.

DESIGN ENGINEERS (two): for the design of new process plant and buildings and the preparation of lay-out and arrangement drawings. Applicants should have had engineering shop training and should possess a Higher National Certificate in mechanical engineering or similar qualification and have had experience of detail design and lay-out work in connection with chemical plant.

Applicants for all above positions should be about 30 years of age and substantial salaries will be paid to men with ability, enthusiasm and sound experience. Bonus and superannuation schemes are in operation.

Write: CHIEF ENGINEER, Albright & Wilson Ltd., Oldbury, Birmingham.

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ONE—Similar machine by Porteous.

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Four horizontal Steam Jacketed **TROUGH MIXERS**, by Gardners of Gloucester, 5 ft. by 4 ft. by 4 ft. Glanded ribbon-type agitator, slide bottom outlet. Arranged for drive through machine-cut gear and pinion.

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Five Large Filter Presses.
Rectangular Storage Tank, 128-tons capacity.
Ditto, 108-tons capacity.
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